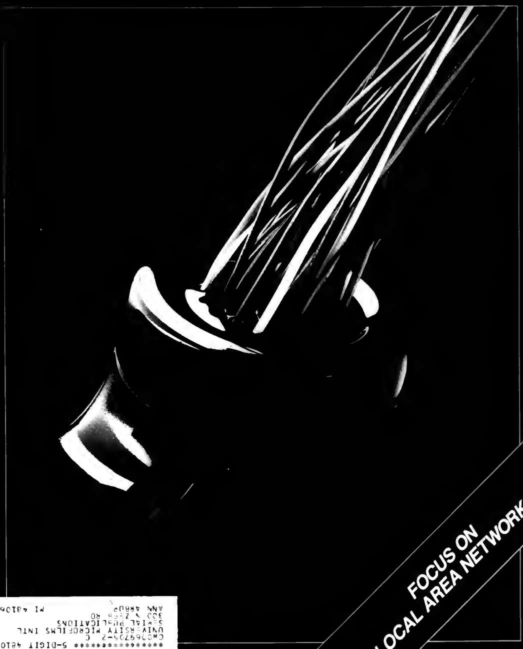

FOCUS ON
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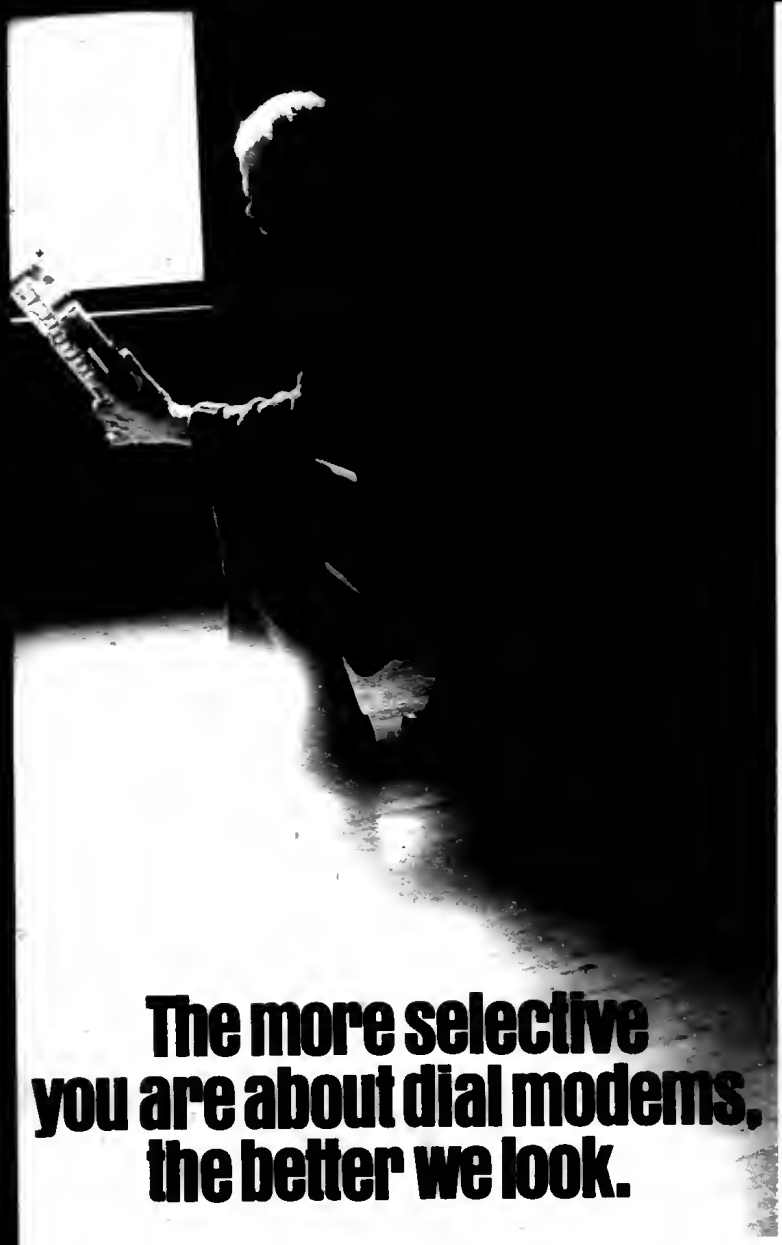

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*McGraw Hill's "Data Communications" magazine rated us as having the best technology and price/performance

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Second-class postage paid at Framingham, Mass., and additional mailing offices. *Computerworld* (ISSN-0010-4841) is published weekly except January (5 issues), February (5 issues), March (5 issues), April (6 issues), May (5 issues), June (5 issues), August (5 issues), September (7 issues), October (5 issues), November (5 issues), December (5 issues) and a single combined issue the last week in December and the first week in January by CW Communications Inc., Box 880, 375 Cochituate Road, Framingham, Mass. 01701.

Computerworld subscription prices: $2.00 a copy; U.S. — $44 a year; Canada, Central & So. America — $110 a year; Europe — $165 a year; all other countries — $245 a year (airmail service). *Computerworld Focus* price: $5.00 a copy. Four weeks notice is required for change of address. Please allow six weeks for new subscription service to begin.

Computerworld can be purchased on 35mm microfilm through University Microfilm Int., Periodical Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. *Computerworld* is indexed; write to Circulation Dept. for subscription information.

POSTMASTER: Send Change of Address to Computerworld Focus Circulation Dept., P.O. Box 1016, Southeastern, PA 19398-9984.

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FOCUS ON NETWORKING

DEPARTMENTS

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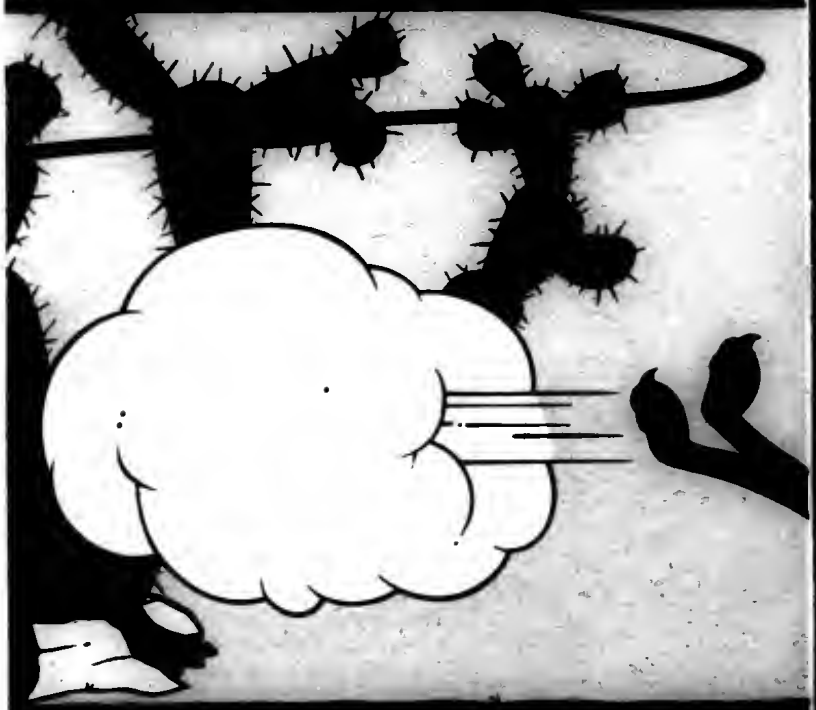


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VIEWPOINT

EDITORIAL

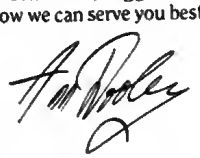
MIS The Consultant

What will the new year mean to the MIS manager? Which, if any, new technologies lurk around the corner waiting to emerge? Or what surprises will the end-user community have up their sleeves for the unsuspecting MIS manager or top management?

Ever since the computing function emerged from the insulated world of the computer room, the role of MIS has been in an almost constant state of change. The microcomputer explosion and the rise of the end-user community shattered the self-imposed barrier between computer technologists and the real world. As each new responsibility is added and demands accelerate, MIS managers must shift roles. Faced with the task of controlling the micro, the critical problem of tying equipment together through communications links, providing decision-making and analytical tools and, in the not too distant future, integrating information flow from the factory to the rest of the company, it may seem like MIS is being asked to do it all — and frequently it is.

MIS managers need to manage their fiefdom, not by loosening the reins of control, but by acting as overseer to all the components under their control. In essence, MIS managers need to act as consultants to their own organizations. The emphasis should be placed on management, evaluation and coordination of the technology and resulting information flow rather than on the actual production of it. The first step toward this was taken in the micro arena. No matter who works with the equipment, it is MIS who imposed the standards and therefore retains control of the technology and purchasing decisions. This same scenario can be acted out in communications, the information center and the factory. MIS should not drop the reins of control, but oversee and arbitrate as more sophisticated and integrated systems develop within the organization. In the role of consultant, MIS will be the expert, advisor, final decision-maker and long-term planner. And that should make for a very good year.

Welcome to 1986! We plan to provide you with the most comprehensive coverage of technologies possible. As we did in 1985, we will devote each issue to a specific technology that is of concern to you and your organization. Our January *Focus* covers communications, including analyses of the hottest technologies, explanations of new products and how integration can occur. We welcome your comments, suggestions and war stories. Please let us know how we can serve you best in the coming year.



INSIDER

Good News And Bad News

By Timothy J. Caffrey

It's easy to lose touch with reality in the often murky world of networking and communications issues. A survey of attendees at a recent International Data Corp. (IDC) industry conference highlighted some interesting characteristics of real world directions. One result: 60% of the 180 respondents indicated their communications management is still highly centralized. That's no real surprise, but it underscores the tenacity with which control is being maintained — only 6% indicated that here was some degree of decentralization.

For IBM, there was good news and bad news. Those respondents who said they had already standardized on Systems Network Architecture (SNA) for communications numbered 35%. Another 28% said they would do so by 1988, but 32% vowed they would never standardize on that architecture. Fast moving LU 6.2, IBM's stated link to SNA, has been adopted by 7% of the respondents. Another 57% indicated they would standardize on LU 6.2 by 1990. Yet 36% — the non-SNA crowd — said LU 6.2 would not be important to them. While that's probably what IBM hoped for, SNA and LU 6.2 also form an easier target for competitive links to the IBM systems world. The non-IBM world is still up for grabs.

The jury is still out on the IBM token-ring challenge to Ethernet, but the verdict may soon be delivered. While 38% of respondents see no significant advantage to the IBM scheme, 51% agree it surpasses Ethernet implementation. In the dragon-slaying department, almost half of the respondents said micro-mainframe links are mostly hot air.

The communications industry barometer indicates we may soon see a reorientation to the workstation rather than the network behind it. As planners look for alternatives to the standard personal computer, interest in voice and voice/data workstations has accelerated. In the survey cited above, more than half of the respondents said they were seriously interested in voice/data terminals.

To date, however, that interest hasn't translated into sales. I am convinced much of the problem lies in the orientation of current products. Most were designed to be an extension of the computer rather than the telephone. As a result, users are confronted with complex interfaces that really don't focus on improving quality or content of voice communications. Given the amount of time most people spend on the phone, a new approach could spell big productivity improvements.

One design targeted at that potential comes from Datapoint Corp. in San Antonio — the new Minx workstation that incorporates full-color, full-motion video into the IBM PC world. Sure you need a broadband network and the price is a bit steep, but there isn't much out there that can match its capabilities.

The revolution continues. Digital Equipment Corp., former industry giant, has recently been creating opportunities to underscore the fact that the company's real strengths lie in networking. The announcement of the VAX 8650 — little more than a repackaged 8600 — created an opportunity for Chairman Kenneth Olsen to reiterate publicly, "It appears we are the only ones who can make a complete network."

West of the Rockies, Convergent Technologies, Inc. and 3Com Corp. inked a merger agreement that would create a new company under the direction of Convergent's Paul Ely. 3Com got Convergent's distribution channels. Convergent gained the opportunity to complete with vendors in the networking game. Convergent also leapfrogged the computer industry slump to join DEC and others in the brave new world of networked solutions. Pity the poor computer vendors they left behind.

Caffrey is director, strategies for micros and office systems, for International Data Corp. in Framingham, Mass.

Computerworld Focus

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Q&A

Corporate Views Changing On Communications

Robert A. Yellowlees is president and founder of American Telesystems Corp. (Amtel), an Atlanta consulting, planning, design and implementation support firm for information and telecommunications systems. Prior to founding Amtel in 1982, Yellowlees was vice-president of IBM's General Systems Division. Yellowlees shared some of his views in a recent interview with Computerworld Focus.

How is telecommunications perceived by corporate executives today?

More corporations are recognizing the importance of telecommunications to the success of their business, yet there is very little understanding of the magnitude of the investment and time that goes into voice communications today. There's an awful lot of equipment being installed, but an inadequate amount of planning and training of the people who will not only use the equipment to perform the old functions but also take advantage of some of the new functions available on a digital network.

Do you think voice mail will be successful?

Yes, for three reasons. The first is its natural extension of communications. Second, I think that MIS and telecommunications groups are more aware of the capability of voice mail. And finally, the cost and function of these systems are improving to the point where the entry-level price is attractive. Voice mail is the sleeper in office automation.

There is a powerful drag on this technology, however. Electronic mail has been successful because it's part of the love affair with the micro and a product of the information systems mentality. The result has been electronic mail systems installed by information systems people with a bias to computers and an inability or no desire to understand human communications.

Robert A. Yellowlees

There seems to be a movement at most corporations to bring telecommunications under the MIS wing. Do you feel telecommunications might not be given fair play as a result?

No. The enlightened MIS executive is making an overt effort to become more knowledgeable in voice communications, and the really enlightened MIS executive is becoming more focused on the role of end user requirements planning that embraces both information systems and telecommunications.

Many in MIS can learn from what their colleagues are doing in financial service companies, banks, insurance firms and other communications-intensive businesses. Here, communications has a more direct bearing on survival. In these firms, MIS and telecommunications have been working together for years. Senior executives also tend to be more directly involved because they know their lack of telecommunications knowledge would be an impediment to their ability to run the businesses effectively. These companies have been leaders in integrating data and voice simply because they have to be.

Would you recommend keeping MIS and telecommunications separate?

Generally, I think it's best to have telecommunications and MIS coordinated under the same executive. It could be implemented in different ways, but both should at least be managed by the same executive. In any sophisticated business that is a heavy user of information systems and telecommunications, there's going to be some separation and specialization.

Why has video conferencing been a disappointment to date?

It hasn't been well understood by either the vendors or the in-house support staff of those companies putting video conferencing in place. What both have tended to do is put in very elaborate and expensive full motion video conferencing systems without first adequately planning who the users should be or training and providing for user incentive.

Some companies buy video conferencing on good faith, hoping it will have enough sex appeal to attract the executive team. We've found, however, users have to be very definite about how and where they use it. There is also the misconception that video conferencing should replace corporate traveling altogether. In our research, we've noticed executives still feel strongly about traveling to local and remote locations in their companies, to meet and be seen by employees. Executives equate such traveling with the leadership role they feel they need to exert within their companies.

Recently you mentioned that all three levels of management — executives, mid-management personnel and professionals — listed information retrieval, analysis and data manipulation as the most useful functions that a personal computer could perform for them.

Let me clarify that. Those are the most useful functions, but is the data they want available? If you can't get data from the host in the form executives need, then the personal computer is no help.

How that been a problem to date?

Yes. In most companies, information systems in use today evolved over a couple of decades. They were not originally designed with the idea of people accessing data with microcomputers. The result is structural problems in the programs and data bases that make access difficult.

That's why it's important to be very crisp about what data executives need. If data can't be transferred to executives in an easy way, then funds should be invested over time to make the necessary system changes. In the meantime, attention could be placed on applications that are easier and more directly applicable to the executive, such as voice mail.

— Stan Kolodziej

BLUE BEAT

Communications — IBM's Strategic Imperative

IBM is rapidly becoming a full-service communications supplier. It has maneuvered into this role due to recent fundamental changes in the information processing market. These include AT&T's divestiture and the ensuing void in end-to-end services, the explosive proliferation of distributed computing via personal computers and users' rapidly evolving business requirements. Indeed, communications is now an integral part of large users' strategic information systems.

Communication systems and services thus represent new markets and crucial new revenue streams from IBM in its quest to reach the $100 billion revenue mark by 1990 and double that by 1995. IBM's role in the communications industry will significantly expand during the next five years as it aggressively pursues opportunities in:

- Local communications.
- Voice/data integration.
- High bandwidth communications.
- Network management and control.
- Standards implementation and integration such as Open Systems Interconnect (OSI), Integrated Services Digital Network (ISDN) and Manufacturing Automation Protocol (MAP).
- Coordinated switching systems.
- Joint ventures with local and regional phone companies and Postal Telephone and Telegraphs (PTT) in Europe, Australia and Japan.

IBM has been laying the groundwork for this assault on the communications industry by gradually creating an infrastructure to support it. During the past three years, IBM has plunged into the value-added network/electronic DP services market; acquired a major private branch exchange (PBX) vendor (Rolm Corp.); bought into 16% of MCI Communications Corp.; introduced a plethora of local-area network and cabling products; developed a new peer-to-peer architecture within Systems Network Architecture (SNA) (PU 2.1/LU 6.2); actively supported standards (recent introduction of OSI and MAP products); opened SNA (via documentation) to non-IBM products; and created a separate Telecommunications Product Organization (TPO) that has merged into its Communications Products Division. IBM has also unveiled new modems, switching systems and SNA software products.

As little as five years ago, IBM seemed to view communications as a necessary evil in its DP environments. SNA was born out of this attitude — some early users would suggest spitefully — in the mid-1970s. But IBM recognized that data communications was becoming more important to its large users and purchased a one-third share of Satellite Business Systems (SBS). SBS was intended to give IBM large users' private networks a future hedge against capricious leased-line or bulk service price increases by AT&T. Although it was a perennial money loser, SBS did serve its purpose.

By Dale Kutnick

But the information processing world has changed radically since the late 1970s. Divestiture has forced large users to take control of their networks and to view them as a strategic asset. Network management and control will be one of the critical elements in extending a company's reach to suppliers, distributors and customers. Standards, interconnection and flexibility will be other service requirements.

Users are now developing network centers to consolidate their switching equipment and communications services so that they can be proactively managed as a resource. Both IBM and AT&T are aggressively moving to be the users' primary partner in these network centers.

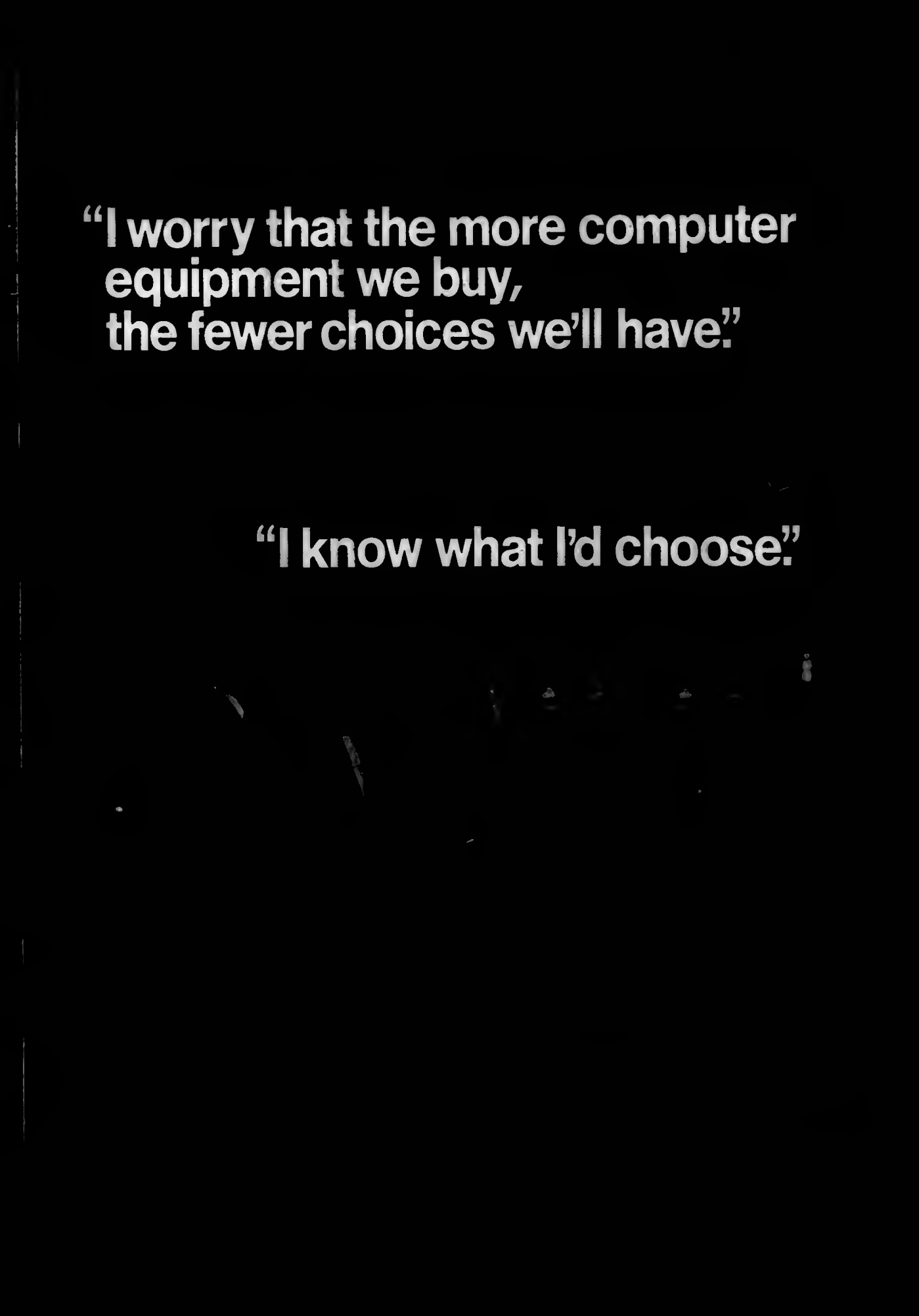
IBM, of course, has the advantage because SNA is now pervasive. But IBM is taking no chances. It is actively supporting international standards and adapting its products to work with them. In the U.S., IBM has been a major supporter of the MAP factory local-area network standard (802.4) along with its own 802.5 token-ring local-area network. It even supports an Ethernet-like local-area network (802.3) — the original PC network.

IBM has actively encouraged third-party connections to SNA by opening SNA protocol specifications. Concomitantly, IBM is actively strengthening its hold on users' networks through sophisticated network management products that will form the logical relationships and information delivery mechanisms between systems. Indeed, as networks grow more complex, sophisticated software products built into SNA (and network hosts) will be IBM's strategic imperative. All of its products and services will fit under this umbrella, and standards will provide the interconnection.

Kutnick is an independent consultant based in Wayland, Mass., specializing in strategic planning for IBM users and competitors. He was formerly executive director of The Yankee Group.

"I worry that the more computer equipment we buy, the fewer choices we'll have."

"I know what I'd choose."



Wherever you paves the way for

Lots of computers do their jobs well. They satisfy your current demands and probably make some allowance for the future.

But what happens when the future demands fuller integration? Closer interaction with different manufacturers' equipment? When you're heading for office automation, where's the best place to start?

With AT&T equipment, you needn't worry. Because AT&T Computer products are designed to fit your needs now, and accommodate them as they evolve or grow.

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Points of Entry.

AT&T's line of personal computers starts with the AT&T PC 6300. It gives you access to an entire range of popular MS®-DOS applications, and you can upgrade to the AT&T PC 6300 PLUS as your needs grow.

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Likewise, the AT&T UNIX PC product line bridges the gap between UNIX System V and DOS applications with a new DOS-73™ Coprocessor. The Model 7300 can be upgraded to a UNIX PC Model 3B1 with all the power, memory and storage you need to handle the demands of up to five simultaneous users.

When you need to step up to departmental power, look to our 3B Computer line. These powerful machines communicate among themselves, other

start, AT&T's full line of computer products a smooth growth path to the future.

UNIX System V-based machines, as well as MS-DOS PCs and mainframes supporting 3270 protocols.

The 3B's stretch from supermicro to supermini, and they're all true 32-bit machines, which run UNIX System V.

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THE COMPUTERS WITH THE FUTURE BUILT IN.
AT&T 3B Computers and AT&T DATAPHONE I Modems

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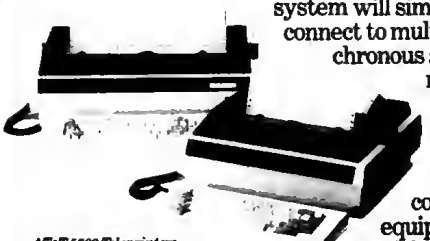
AT&T offers a broad line of both asynchronous and synchronous data products designed to work with what you already have and with what you may eventually want.

Our teleprinters and dot matrix, line or letter quality printers work with virtually any PC or minicomputer. All it takes is a standard communications interface.

When it comes to terminals, AT&T's line stretches all the way up to the modular, 3270-compatible AT&T 6500 Multifunction Communication System. With its windowing capabilities, this system will simultaneously connect to multiple synchronous and asynchronous hosts.



AT&T 5300 Teleprinters

The final link in the information chain is data communications equipment, and AT&T has it all. From asynchronous and synchronous modems right up to the evolving DATAPHONE*II line of analog modems, digital service units and multiplexers.

They're all designed to work together, maximize your network's flexibility and minimize your downtime.

The Information Map.

AT&T offers a number of ways to share information. Computers, peripherals and even PBX switches can be linked at both local and departmental levels through systems like AT&T 3BNET and the AT&T STARLAN NETWORK.

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With AT&T 3270/SNA or 3270/BSC Emulator+ Software, you gain access to mainframe applications traditionally reserved for 3278 display station users.

And for even more access, there's the AT&T Application Program Interface. This allows 3B users to process mainframe data using the resident applications programs they've already developed.

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MANAGER'S CORNER

Network Control — Not Dirty Words

By Jim Young

Coming from data processing, control is a dirty word. To technicians it implies waste of their talents on menial tasks, not to mention assuming the duties of a policeman. To users it conjures up bureaucratic obstacles and restrictions and is about as popular as food rationing on a long cruise. Unfortunately it is often necessary.

Controls come in many flavors. A well-run environment will require authorization to look at or change data. Techniques will be used to ensure that data input is accurate and nothing is lost in translation. Some controls will measure the efficient use of resources while others will prevent inadvertent mishap. For these older applications, DP and the rest of the world have reached a happy equilibrium between too many controls and too few.

Sadly, an exception to this is some of the newer communications environments. As networks become more complex and less standardized, it is harder to institute controls. Local-area networks with many device types and a diversity of transmission activities face this problem.

The reasons for the resulting low levels of controls are varied. Perhaps the communications environment is changing too much, and controls will be put in when things settle down or perhaps we don't want to throttle our communications growth with a bunch of restrictions. Some may answer that communications are harder to control with traditional methods or that many of the tools are not yet available. Others may feel that controls are less necessary for the applications included in their network. A few will claim that they are controlling things very well, thank you.

There is some truth to each of these statements; however, the undercurrent of these comments points to several tendencies. One is that controls in communication environments are often spotty or haphazard. Moreover there are no easy solutions to overcome the lack of controls. New functions and technologies are great, but organizations need to supplement these with disciplines and procedures that can track and react to the vital signs of our communication networks. The resulting controls will yield a number of benefits.

With the right checks and screens, data accuracy can be maintained. Data integrity is an area that is especially complex in a network environment in which data can be duplicated in several locations. Without sophisticated software controls, users must resort to simple-minded rules to prevent data pollution and a complete breakdown of confidence in company information.

The right controls can also improve the efficiency of your operation. Communications frequently allows users discretionary use of resources such as storage space. This privilege need not be eliminated when it can be controlled. Use of disk space or communications media can be shared in such a way so as to optimize service while reducing costs. Simple procedures such as freeing up silent communication lines can work wonders by allowing computers to get at waiting customers. In the long term, your system can be balanced for better performance by putting resources where they are needed. A further benefit from the ability to control the communication network is improved service.

It should be obvious that despite the excuses used to defer communications controls, they can certainly reward the effort it takes to install and maintain them. In fact some would strongly argue that because of the broader interface with a wider population, communications environments need extra attention to stronger and more robust controls. And they are more than just protection; controls let you know what is going on in your network. If you wonder about your own controls, ask yourself some questions. Can you tell who is accessing what data? How easily can your passwords be compromised? Do you or your users control them? And most important, who in your organization is responsible for network controls?

If you can answer these questions (especially the last) and many others with some degree of comfort, then perhaps you are ahead of the game and well on the road to taking full advantage of your communication network. On the other hand, there may be a lot of fundamental work needed to put you in charge of your network. All the excuses to limit communication control will still be with us, but so will the benefits.

To get the full return from investments in communication and to avoid exposure to unnecessary risks, make a resolution to evaluate your situation. It's 1986; do you know what your network is doing?

Young is MIS director and responsible for user technology at a major Massachusetts manufacturing firm. He has worked in the industry for 15 years.

NEWS

Campus Lays Networks For The Future

Campus of the Future

Though designating itself the Campus of the Future might sound like hype, the University of Pittsburgh has been forging ahead with enough innovation in communications to make other U.S. campuses take notice.

Three years ago, the University of Pittsburgh was coping with a number of communications problems hardly unique to its campus. To begin with, three separate university groups were in charge of data, voice and video communications.

"One group had developed a hodgepodge of data network pieces from various vendors," explained Dave Forejt, associate vice-president for computing and telecommunications at the university. The group in charge of voice was in the process of looking for a large private branch exchange (PBX) system, and a third group was trying to find ways to improve its on-campus video instructional facilities.

"While searching for a way to contain telephone costs," Forejt said, "the groups got together and asked if they could get one unified, comprehensive data and voice network. Then it was decided that if they could throw in video on the same network, all the better."

Various telecommunications vendors were approached and asked if they had a solution, and AT&T came up with the best answers for the university. The result, two years later, is a backbone campus transmission network of over 400 miles of optic fiber cables that can simultaneously transport voice, data and video (television) communications throughout the entire campus.

The first component of the system was an AT&T System 85 PBX that has the job of coordinating about 11,000 telephones scattered throughout offices, classrooms, laboratories and other facilities on campus. At the same time, computer data is transmitted over the same fiber cable between several Digital Equipment Corp. minicomputers and microcomputers. (IBM protocol converters and RS 232 ports provide interfaces for IBM Personal Computers, compatibles, and other micros.)

AT&T used its Information Systems Network (ISN) multiplexers to split channels and handle data communications through the PBX. Before ISN, university computer users had to work at specific Computer Access Sites (CAS) to communicate with designated host computers, a situation that often meant long lines or making trips across campus.

Students can now talk to any computer on the ISN network both on- or off-campus, if they are assigned authorization. "There are currently about 1,500 ports installed on the local-area network," explained Hobie Harris, senior technical consultant with AT&T Information Systems, "with nearly 2.4 million feet of individual fiber strands installed. They've hit about as much fiber [cable] as they want right now. There's plenty of room for expansion."

The final phase has been the installation of video or television facilities over the network.

"Before this, university employees would cart video monitors and tape to classes," Forejt explained. "Now video can be transmitted to 21 classrooms, lecture halls and seminars, with plans to go to another 100 classrooms in a few years. Through a central switch, a professor is able to call up existing video resources or live lectures from off-campus." Forejt added that professors will soon be able to tape a lecture and automatically store it at the university's video center.

Immediate plans call for extending ISN services to four of the University of Pittsburgh's regional campuses, tying them into the main campus network system.

Forejt added that other future projects include campuswide electronic mail, video bulletin boards and access to automated card catalogs in the university's 18 libraries.

All Aboard The IBM Bandwagon

As a result of IBM's recent entry into the local-area network arena, network manufacturers have jumped on the token-ring bandwagon in force. On October 15, the very day IBM made its announcement, 3Com Corp. and Bridge Communications, Inc., both of Mountain View, Calif., announced intentions to develop network products compatible with the IBM Token-Ring.

Also on October 15 came announcements that were more than intentions. Nestar Systems, Inc. of Palo Alto, Calif., announced compatibility of its Plan Series local-area networks with IBM's Token-Ring and added, "This announcement is part of Nestar's commitment to providing state-of-the-art local-area network systems that are 100% compatible with IBM's strategic direction and complementary to IBM's product offerings." Proteon, Inc., the Natick, Mass. developer of the Pronet family of local-area network systems, introduced Pronet-4, an IBM-compatible 4M bit/sec token ring local-area network. Santa Clara, Calif.-based Ungermann-Bass, Inc. said it was expanding its Net/One product line to include an IEEE 802.5-compatible system that will allow users to configure a 4M-bit/sec multiple ring system. A few days later, on October 23, Excelan, Inc. of San Jose, Calif., announced its intention to develop an array of products for IBM's Token-Ring local-area network in the second half 1986, and on November 20 at Comdex in Las Vegas, Televideo Systems, Inc. announced Telenetware, a customized OEM version of Novell, Inc.'s Advanced Netware. Telenetware incorporates support for DOS 3.1 and IBM Netbios network functions as well as several new features to facilitate bridging to the IBM Token-Ring local-area network.

While the above companies, if pushed, might agree with industry experts that IBM's Token-Ring is about as exciting as solitaire, at this point it may be the best game in town. As Tom Henkel, consultant with the Boston-based Yankee Group succinctly put it, "I guess it's something of a tradition. Every time IBM announces a new strategic product, a certain number of vendors announce support for the same thing. So what else is new?"

ISSUES AND ANSWERS

Users Contend With Communications Dilemmas

By Robert D. Gilges

MIS managers are well aware that communications is a major issue for them. The communications software market grew at a rate of over 60% between 1982 and 1984 and is expected to increase at a rate of 50% or more per year through 1989. Communications expense has for several years now been the fastest increasing category of MIS expenditure. Recent surveys suggest the rate of increase in large MIS shops approximates 20% per year. Talk to chief executive officers and vice-presidents of MIS and they'll tell you the same thing. Costs are up, but benefits remain elusive. Let's examine some of the reasons:

- **Lack of Compatible Standards:** Each vendor tends to be committed to its own standards; however, there is a highly visible effort currently underway to bring these standards together into a cohesive framework. Many organizations such as the International Standards Organization (ISO), the American National Standards Institute (ANSI) and the Consultative Committee on International Telegraph and Telephone (CCITT) are working together to develop a reference model for Open Systems Interconnect (OSI).
- **Lack of Integrated Systems:** What good does valuable information do if you cannot communicate it from one application system to another or from the application system to the manager who needs to use it? Again, the big benefits will start to accrue only when true integration of the major corporate systems is achieved.
- **Lack of Qualified Personnel:** There are simply not enough gurus to go around. Benefits will increase when more companies have more data communication experts to address the problems.
- **Lack of Communications Planning in Systems Development:** Communications requirements are often not adequately addressed when a company plans its systems strategy and develops its systems. When building systems, the network solution must be addressed and conquered before the conceptual design can be completed — not as a quick afterthought when being asked to review and approve the detail design document. Organizations are finding that benefits will most likely be directly proportional to the amount of time and effort devoted to the communications solution in the early planning stages of that new system.

"Don't tell me the problems, tell me the solutions!" That's what executives confronting these issues say consistently. So how do we in the computer industry respond? And what is incumbent upon the end-user community? What must each party do to produce the data communications environment that supports the profitability and growth of dynamic business? Some suggestions are the following:

- Major vendors and international standard setting organizations must agree to implement a common worldwide telecommunications architecture.
- We must develop products that permit a high level of functional integration throughout a company. Communications products must be easier to use and understand.
- Academic programs must be developed to produce an increased number of communications professionals with a broader perspective on business and specific technical specialties.
- Companies must be sure that the long-range information systems planning process has a communications component that adequately addresses related issues and corporate requirements.
- The latest in systems development productivity tools should be used interactively by project teams to produce quality systems on time and within budget.

Obviously, this all can't be achieved overnight.

But the combination of proper industry leadership and strong management commitment within user organizations will help achieve the benefits that lay ahead.

Gilges is partner in charge, information systems services consulting, at Peat, Marwick, Mitchell & Co. in New York City.

NEWS

Bell Co. Buys IBM Software Maker

It seems to be a case of follow the leader, although it's sometimes difficult to know who the leader is. First there was IBM, the computer maker, and AT&T, the phone company. Then IBM bought Rolm Corp. Shortly thereafter, apres divestiture, AT&T came out with its first computer, although the technology had been ripe in New Jersey for years. Also as a result of divestiture came the real dissolution: in true hermaphroditic fashion, the giant AT&T, once split, gave birth to the seven regional holding companies.

Well, something new may be occurring in the land of the giants once again. Ameritech, a regional Bell operating company located in Chicago, has begun the process of acquiring Applied Data Research, Inc. (ADR), developers of IBM mainframe software programs that include The Librarian, Roscoe, Empire and Ideal. Although ADR reported a $2.3 million loss on revenues of $103.7 million through the third quarter 1985, compared to a $4.6 million profit on revenues of $83.7 million during the same nine-month period in 1984, it is still considered to be one of the more successful mainframe software companies.

Ameritech, with 1984 earnings of $990.6 million on revenue of $8.34 billion, is expected to pay $215 million to acquire ADR, with a per share price of $32, $10 per share more than the trading price the day before the announcement.

William L. Weiss, Ameritech's chairman and chief executive officer, said his company's acquisition of ADR would help Ameritech meet the future information systems requirements of its major business customers, including those of Illinois, Indiana, Michigan, Ohio and Wisconsin Bell Telephone Companies. John R. Bennett, chairman and chief executive officer of ADR, said the takeover would make ADR more secure in its competition with IBM, and software research and development could continue with less concern for immediate bottom-line considerations.

There is no doubt Ameritech's purchase of ADR is a harbinger of things to come, said Jeff Kaplan, manager of the communications programs at the Framingham, Mass.-based International Data Corp. "In terms of impact, there tends to be something of a copycat mentality among the regional holding companies. Ameritech taking the initiative to acquire ADR is an action likely to be emulated by the others."

John Dexheimer

But according to John Dexheimer, an associate with Broadview Associates, a Fort Lee, N.J.-based firm that was involved in the ADR acquisition, this is not the first time one of the Bell operating companies purchased a mainframe software company. "Nynex acquired a Massachusetts-based logistics-oriented software company and Cincinnati Bell bought two [companies involved] in the area of telephone call accounting," Dexheimer said. One of the reasons for these acquisitions has to do with the Bell operating companies' own internal needs, he added. "Some of these [operating companies] are going to crack $10 billion this year. They're probably spending close to $1 billion on their own data processing needs. They know that business very well because they're probably developing some of the most sophisticated systems around," Dexheimer explained.

Although Ameritech and ADR each stand to reap great benefits from their association, there is also a calculated risk involved. And before the other Bell operating companies jump on the acquisition bandwagon, they might bide their time and observe how Ameritech does with its new product line. "The caveat there," Kaplan said, "is that Ameritech, like AT&T in a sense, is not experienced in marketing that kind of sophisticated product. Ameritech's credibility may be hampered and customers may go elsewhere. And ADR, which has a good reputation, could have that reputation tarnished by its association with Ameritech unless Ameritech is equipped to market [ADR's] services effectively."

Another unanswered question is whether Ameritech's acquisition poses any threat to IBM. Kaplan sees no such threat. "If you look at IBM as being some sort of marathon runner and you know they're going to win in the end, you just want to stay close. What Ameritech is doing is to stay close to both IBM and AT&T in two related but different realms."

Correction

Hewlett-Packard Co. deserves more credit than it received in the last Focus *issue. HP is the vendor shipping a uniform DBMS access on IBM PC and its mini. HP also offers its Image DBMS with its office product line.*

TECHNOLOGY INSIGHT

New Growth In Hybrid Networks

BY JAMES G. HERMAN

Cost-effectiveness will always be the major factor in network design, but this goal will no longer be adequately met by detailed tuning and analysis of specific configurations. Today's networks change too frequently and their use is extremely difficult to predict. It is no longer wise to save a few percent on overhead at the expense of having a rigid protocol architecture that will be difficult to adapt to future uses. Similarly, it is shortsighted to configure a network so that all lines are utilized at 90% because this limits the rapidity of bringing on future applications and users.

Instead, the most progressive network managers are purposely designing networks with excess capacity, using a concept of bandwidth inventory. Cost-saving measures in such a context must focus on the provisioning of expensive network resources, most notably transmission capacity. Large government and commercial users are actively seeking new sources of transmission that can dramatically reduce the cost of providing network service, in some cases by over 25%. The most innovative ones are experimenting with hybrid networks that combine the best features of many different sources of transmission.

By using a variety of transmission media and supplies, an organization can protect itself against the uncertainty inherent in today's telecommunications marketplace. Diversification is a well-known strategy for dealing with an uncertain future; a diversely supplied network provides significant advantages to the network manager who can conquer the resulting technological and operational consequences. Diversity increases the network's flexibility to adapt to changing requirements and innovations in telecommunications technology.

Hybrid networks provide an evolutionary approach for dealing with the rapid changes in telecommunications technology. As one source of transmission (for example, the dedicated 9.6K bit/sec terrestrial circuit) becomes more expensive and less able to meet user needs, the most beneficial new technologies (such as T-1 circuits) can be systematically employed to meet new requirements. The result is that old technologies eventually die out while the best of the new rise in importance. Such a strategy requires experimentation with new technologies and new sources of transmission as well as a network architecture that can cope with heterogeneity.

Innovation in obtaining transmission capacity can take many forms. Many large users are starting to purchase their own facilities (such as microwave or satellite systems) and bypass the telephone

companies completely. Some are even laying their own fiber-optic cables between nearby buildings or on campuses. Others such as Merrill Lynch & Co. are using private transmission to access long-distance carriers such as AT&T directly and bypass local Bell operating companies.

The use of privately purchased systems avoids uncertainty in future costs. It also provides a useful bargaining advantage when negotiating prices for services currently obtained from the common carriers. If there is a need for large amounts of bandwidth (more than a couple of megabits per second) in remote locations, such bypass technologies may currently provide a less expensive alternative to leased transmission. More important to some organizations is how rapidly a new service can be installed when using some of these bypass technologies, most notably microwave.

Networks employing bypass technologies are part of a larger trend toward hybrid public-private networks. In the case of bypass technology, transmission capacity is partially provided by privately owned systems with the remainder leased from public carriers. The same approach can be taken in other areas of the network. Many private data networks today employ public data networks (such as GTE Telenet Communications Corp.'s Telenet and Tymnet, Inc.'s Tymnet) for access to their private networks from remote locations that may have only one or two terminals.

The same strategy is often used in voice networks. Many large corporations use a private tandem voice network to link their major offices and save on long-distance changes. They still employ the public networks, however, to reach small, remote sites and to contact other companies. Many of these systems are designed so that excess calls are routed over the public network during peak hours when private lines are full, thus avoiding blocking.

Many factors point to an increase in the mixed use of public and private services. There are an increasing number of public data networks and new offerings by AT&T and other long-distance carriers for hybrid public-private voice networks. Perhaps most significant is the development by most of the local telephone companies of their own public data networks for transporting data within their local calling areas. These public packet-switching networks will handle user data needs more economically and efficiently than dedicated low-speed access lines, and telephone company pricing will reflect this. Thus, most private networks will need to interface with public networks for lower cost access at the local level.

Bulk purchases are another strategy for lowering the cost of providing a network. A tremendous amount of attention is focused today on the use of T-1 circuits that operate at 1.544M bit/sec in the U.S. (2.048M bit/sec in Europe). For the cost of between six and 10 56K bit/sec circuits, a T-1 circuit provides the equivalent of 24 56K bit/sec circuits. Significant cost savings can result as well as major infusions of capacity when transmission requirements from a number of sources (such as voice and video) are pooled in order to justify the cost of a T-1 circuit (see Figure 1, Page 16). The Department of Defense is pursuing such a strategy with the Defense Commercial Telecommunications Network, which it purchased recently from AT&T to provide over 180 T-1 circuits in a nationwide voice, video and data network.

Networks based on the use of T-1 circuits and multiplexers, which are used to derive slower speed subchannels, enjoy significant cost reductions with little or no change to existing data or voice switching and interfacing equipment. The pooling of requirements to obtain such economies of scale is the first easy step toward eventual integration of voice and data. The result today is increased capacity for both at lower cost through the use of a multiapplication, hybrid network.

Innovation in media is another trend in hybrid networks. The mixed use of satellite, microwave, copper and fiber-optic cable and radio in a single network is becoming increasingly common. Each medium is best for

TECHNOLOGY INSIGHT

specific distances, speeds and applications. Satellite is excellent for long distances, especially transoceanic, and for reaching out-of-the-way locations. Microwave can be very inexpensive and easy to deploy for short distances, while fiber-optic cable provides tremendous amounts of highly reliable bandwidth. Radio is necessary for the increasing number of mobile or wireless applications. Cellular radio systems are now offering to carry data, and there are also experiments using FM subcarrier channels to broadcast stock quotes.

The new generation of very small aperture satellite terminals (VSAT) is a rapidly emerging new technology. Operating in the Ku-band, VSATs can be purchased for as little as $10,000 each and offer two-way communications at 56K bit/sec into a central hub. These systems employ a large (6 meter to 9 meter), expensive ($1M to $2M) central hub earth terminal that is capable of transmitting at high power and receiving low-power signals. The earth terminals at the perimeter of the network are smaller (2 meter to 4 meter) and have much lower power and resolution capabilities (see Figure 2, Page 16).

Satellite systems can reach directly to the customer's premises and completely bypass local as well as long-distance carriers. Satellite systems offer complete insulation from future rate increases and a predictable installation schedule. They are unique in offering broadcast transmission capability over long distances. They can be particularly important for organizations with remote, isolated locations. This technology is attractive in traditional star applications that have all data focused on a single central site. However, the inherent delay associated with satellite transmission is detrimental to many interactive data applications.

Perhaps more important than the use of mixed media is the use of hybrid-packet and circuit-switched architectures. New forms of relatively high-speed circuit switching that will be incorporated into existing architectures are now becoming available. Until recently, the only widely used form of circuit switching in the U.S. was simple dial-up at speeds of 300 bit/sec to 2,400 bit/sec over the public-switched telephone network (PSTN).

A generation of modems that allows for speeds of 9,600 bit/sec or greater over the PSTN is now appearing. This opens up the possibility for dial-up access to packet-switching networks for hosts and personal computers as well as terminals. Higher speed digital circuit switching services will soon be available from the common carriers. AT&T currently offers Accunet Switched 56, a product that provides a dial-up 56K bit/sec circuit on demand. Although this service is available at only a limited number of locations, it is the prototype used by all the major carriers for future services of this kind.

With these new services, an architecture is developing with an access area handled largely with circuit switching while the backbone remains a packet-switched network. This offers highly reliable access to the network because the dial-in network provides for entry into multiple access points in the backbone. This is unlike the dedicated access lines of today that present a single point of failure and are generally thought to be the weakest area in the technology. This trend is supported by the recent interest in the X.32 standard for circuit-switched access to X.25 packet networks.

The likely end point in this evolution is the complete integration of packet-switching and circuit-switching technologies (see Figure 3, Page 16). In such a system a single interface is presented to the user who selects the kind of service most appropriate for the task at hand. If a large amount of data must be transferred to a single remote location, circuit switching may be appropriate. If intermittent (bursty) interactive query/response usage is needed, packet switching will still be the most efficient technology.

This is the promise of the Integrated Services Digital Network (ISDN) concept that is guiding the development of a new generation of network

TECHNOLOGY INSIGHT

standards and equipment. These services will start to pear by the late 1980s and will provide a complete hybrid of previously separate packet- and circuit-switching technologies.

Many of the media and technologies described above have been in telecommunication networks for some time. In the past, however, a single network would be built out of a single technology, resulting in a satellite data network, a terrestrial data network and, perhaps, a dial-in application. Today's hybrid networks try to integrate transmission systems onto common user networks serving a variety of applications.

In general, hybrid transmisson strategies require network technologies that are very flexible and robust. They must tolerate different speeds, delays and error characteristics. The homogeneous networks of the past — all lines were 9,600 bit/sec leased voice grade links obtained from AT&T — may have some difficulty in adapting to the demands of heterogeneous trunking. Such heterogeneity has long been a factor in the designs of the military and intelligence networks. It will now become ever more important in the commercial sector as well, as proactive network managers continue to seek innovative ways to cut costs and increase network service.

In addition, today's networks must be flexible and easy to reconfigure. They should easily and rapidly accommodate new applications, new access devices (for example, personal computers rather than terminals) and new users. In order to do so, it must be possible to expand the number of trunks, nodes and ports on the network rapidly.

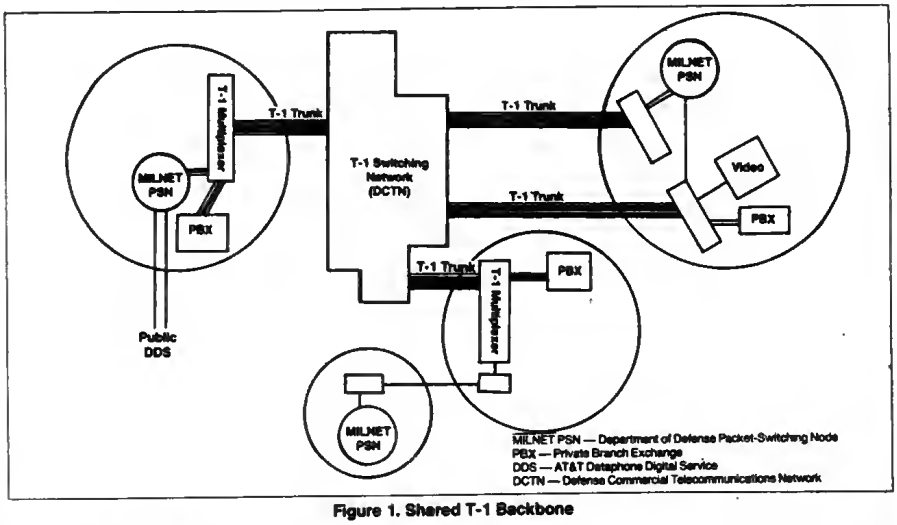

Figure 1. Shared T-1 Backbone

Rather than concentrating on optimizing the network's configuration and expending engineering resources on lowering overheads and increasing link utilizations, network managers will be more concerned with compatibility among devices of many vendors and the availability of tested communications software to perform a variety of advanced functions. Hybrid network architectures can significantly increase a network's flexibility by increasing the options for providing service, if the underlying systems can easily accommodate expansion.

In the multiapplication hybrid network environment, it is much more difficult to predict loading as well as tune the system to achieve optimal response times. With many users from different groups accessing a variety of applications, it will be necessary to distinguish different users and different types of traffic.

The use of priority and type-of-service designators will be necessary in hybrid networks that employ different media and technologies with varying delay and throughput characteristics. Dynamic allocation of network capacity based on priority and type-of-service considerations will replace the careful pre-planned optimization of network configurations.

Hybrid networks with their mixtures of media, technology and supplies are significantly more complex to operate. When something fails, it is difficult to isolate the fault unambiguously and dispatch the proper repair personnel. Carriers no longer provide end-to-end service and finger pointing will probably rise. Careful attention to interfaces, diagnostics and network operations control software will be necessary if today's hybrid networks are not to turn into tomorrow's Towers of Babel. ■

Herman is director, telecommunications consulting groups, BBN Communications Corp., Cambridge, Mass.

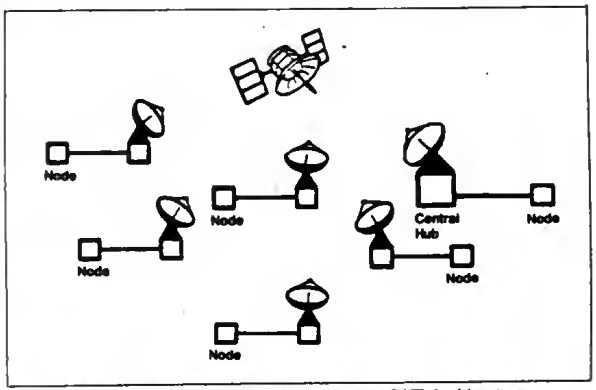

Figure 2. Very Small Aperture Terminal (VSAT) Architecture

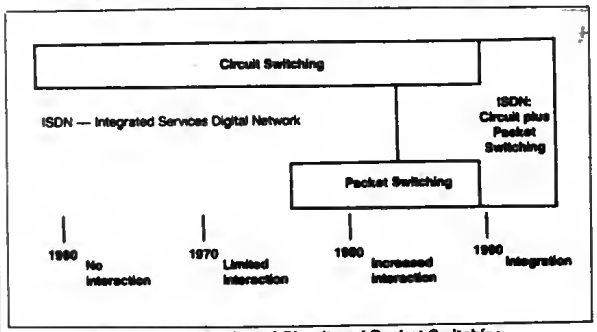

Figure 3. Integration of Circuit and Packet Switching

USER SURVEY

Can Managers Ride the Communications Wave?

◇BY◇STAN◇KOLODZIEJ◇

Communications is never dull these days. That point was driven home again when a number of questions posed recently to a random sampling of corporate managers revealed some interesting attitudes about communications.

Least surprising was the attitude of corporate telecommunications managers toward divestiture; nearly all considered it more of a short-term curse than a cure, citing a gamut of problems from long lead times for circuit installations to ineffective maintenance.

On the brighter side was the positive attitude toward alternatives such as Integrated Services Digital Network (ISDN), fiber optics and teleconferencing. Though ISDN is really only a concept now, most surveyed managers displayed a good knowledge of its technology, benefits and repercussions to their firms and telecommunications overall.

If anything, today's corporate information managers on both the data and voice sides showed a sharp instinct and awareness of the importance of new communications technologies to the competitive advantage of their firms. It was not always this way.

"The first step was to take voice and move it into MIS," explained Tom Martin, vice-president, marketing support at Comdisco, Inc., a Chicago-based remarketer of computer and telecommunications equipment. "The second step was to develop an information umbrella group controlled by a chief information officer. Though voice became part of MIS, they are reporting as peers to this information officer."

ROB SAUNDERS

Martin was describing Comdisco's own experience at reorganizing its internal data and voice structures, but he added that the same sort of reorganization has been underway in the past few years with about 50% of Comdisco's clients. "There is a significant movement to pull voice and data together under one information umbrella, but structure MIS more around its old expertise in applications and data bases. Telecommunications has risen in status with divestiture, but it is also perceived to be important enough to be put under more control."

Gaining control over telecommunications seems to have become a rallying point for many corporations after what most consider the chaos following divestiture.

"Divestiture has left us with a mess of multiple billings and mistakes, calls from multiple vendors, and we're constantly reconfiguring our networks to offset tariff changes," Scottie Hoffman, director of communications at Encyclopedia Britannica, Inc., Chicago, explained. "It's not that life is harder after divestiture, there's

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just more to do. Getting everything under control is a big factor."

Steve Johnson, director of corporate telecommunications at Fluor Engineers, Inc., Chicago, said that divestiture has resulted in long installation lead times and delayed servicing of circuits for his company.

"The WATS and 800 services are good, but anything to do with installing a new private circuit seems to take an enormous amount of time," Johnson explained. "Interfaces between AT&T and the local exchange companies are now pretty well defined, but the local companies are getting bombarded by private companies, large carriers, small carriers and individuals trying to hit them for services.

"Prior to divestiture AT&T at least had long-range facilities planning for everybody, and it was the only game in town so it could plan this based on all requirements. Now everybody is trying to handle everybody's needs and the result is a mess."

The current tendency of voice and data technologies to cross lines is resulting in the integration of the two technologies and is bringing telecommunications further into the MIS fold.

"PBXs [private branch exchanges] are where communications in the voice and data side can come together," Martin explained. "Telecommunications can really benefit from their expertise in this area to exert more influence. MIS has trouble relating to PBXs that have never been part of the computer room. PBXs are a technology that baffles MIS, yet PBX makers, out of necessity, are offering data and voice solutions that will help them offset the influence of local-area network vendors with MIS."

Martin added that PBXs are being thought of more as central processing units, with telephones as peripherals and wires as data channels. "Both PBXs and local-area networks are coming together, and if you look at the three major vendors — IBM/Rolm Corp., AT&T and Northern Telecom, Inc. — each has local-area network solutions, ASCII products and integrated voice/data terminals. The PBX companies have to offer these products to keep from being locked out of the office. At the same time they're giving telecommunications managers more leverage to position themselves as managers of viable office communications solutions," he concluded.

Now reorganization must also deal with a third element: departmental computing. Many firms are adding departmental computing groups and information centers as the third tier in the communications grouping.

The experience at Westinghouse Electric Corp., Baltimore, reflects a common problem and solution within many firms. According to Bob Carman, lead analyst programmer at Westinghouse, "We have about 2,000 personal computers from a variety of vendors at our location. Up until now departments chose the computers, but it got out of hand.

"We set up an information center to control the purchasing of new equipment and set up standards. As long as things in departments were more localized and isolated, it was fine. Once communications came into play through 3270 emulation to mainframes and protocol converters, it got complicated. MIS stepped in and set up the center."

Most questioned companies listed MIS and telecommunications as peers, in the survey almost all managers on the telecommunications side reported to MIS. MIS is definitely in the driver's seat and is strengthening its position further by controlling the growth of data communications at the departmental level.

While most questioned companies listed MIS and telecommunications as peers, in the survey almost all managers on the telecommunications side reported to MIS. MIS is definitely in the driver's seat and is strengthening its position further by controlling the growth of data communications at the departmental level.

Though corporate telecommunications is rapidly expanding, many managers are not happy with the status quo. ISDN is a hot topic, and many managers expressed optimism that it would be an excellent way of integrating voice and data once it's available commercially. Teleconferencing, especially audio systems such as AT&T's Alliance, are being implemented and used.

For example, Johnson at Fluor Engineers described how his company's worldwide audio conferencing system

was used to broadcast plans for corporate reorganization to 24 points around the globe simultaneously. Fiber optics, though still expensive, are being used as reliable alternatives to handle heavy short-haul data and voice communications traffic.

"We're using it [fiber optics] to replace one of our existing T-1 circuits," Eric Martin, telecommunications analyst at International Paper Co., New York, explained. Like many U.S. railroad companies, Grand Trunk Western Railroad in Detroit is laying fiber cable along much of its railway tracks to create an extensive cross-country fiber network.

Network management systems in use ran the gamut from full-blown remote diagnostics systems to little better than call recording devices. But the emphasis still seems to be on middle-of-the-road network management facilities such as the one described by Fluor Engineers' Johnson: "For the voice side we rely on some programs that pick off the call recording details from various PBXs throughout our network. The information is consolidated at our Irvine, Calif., offices and then massaged on a monthly basis. We then pick off two kinds of reports — a financial report used to delegate costs to each of our three corporate divisions and a traffic analysis report to see if the call patterns on the PBXs are being used correctly.

"We do run diagnostics between Irvine and our adjacent node in Houston," Johnson added. "That's handled through our [AT&T] Centrex switch, and it checks noise levels on the lines."

T-1 links, basically buying wholesale from a Bell company and multiplexing up to 24 voice links per channel, seem popular. Some companies are splitting lines, placing voice and data on different channels and saving money. More companies than not will be buying more T-1 links.

On the MIS side, IBM's LU 6.2 peer-to-peer communications protocol is getting attention because of its relation to IBM's System Network Architecture (SNA), which seems to be getting even more play with MIS personnel.

> *'Most local-area network vendors can pick up from this layered interface that IBM has endorsed with its Personal Computer and network and can now add software solutions and market that product against IBM. IBM has really just laid the foundations for the local-area network industry.'*
>
> **— Tom Martin Comdisco, Inc.**

Surprisingly, local-area networks were not as big a concern with MIS personnel as might be expected. Most installed local-area networks were small (the exception being a 400-node Wang Laboratories, Inc. broadband network at a large Eastern bank).

While there was excitement about LU 6.2, IBM's recently introduced Token-Ring network got a yawn. "It raises more questions than answers," Bob Yellowlees, president of Amtel Corp., an Atlanta consulting firm, explained. "It's about time," Martin at International Paper said. "I don't think much about it. We'll still be looking to other local-area network vendors."

Many MIS people who installed IBM PC Networks as an interim solution to their networking problems were disappointed and reluctant to endorse the new IBM network. "I can't see anything that would make us want to leave our PC Network," explained Nicholas Lay, manager of operations planning at Grand Trunk Western Railroad.

Not all agreed. Comdisco's Martin conceded that perhaps IBM's Token-Ring network had little to offer in technology that was unique, but that was not the point. "IBM has endorsed the fact that you can use plain telephone unshielded twisted-pair wiring and offer a 4M-bit local-area network solution," he explained. "This is going to allow everyone to move forward and leverage the telephone wiring in their buildings. They can now say that's where I ought to make my investment and that's going to carry forward because IBM finally said that it will work, without expensive cabling. Organizations can now move forward with local-area networks."

Martin added that IBM's announcing an open local-area network architecture will allow other local-area network vendors to begin building applications on top of the network. "Most local-area network vendors," Martin continued, "can pick up from this layered interface that IBM has endorsed with its Personal Computer and network, and can now add software solutions and market that product against IBM. IBM has really just laid the foundations for the local-area network industry."

USER SURVEY

The interviewed MIS managers agreed IBM's Token-Ring network will, like the IBM PC, become a de facto standard. Ironically, however, they said they have no immediate plans to buy the network. One MIS manager was curious about IBM's local-area network timing: "Usually IBM waits to see how a market develops before moving in and blowing it away. It's not like them to develop a market."

While everyone seemed bullish on what is to come in communications (even divestiture is perceived as positive in the long run), there were no difficulties in identifying current voice and data communications problems plaguing managers. For Paul Inderhees, manager of data communications at Champion International Corp., Stamford, Conn., the biggest problem is incompatibility between computer devices, which he's trying to solve through a combination of "some of our own home-brewed software." They are also trying to use outside standard software packages whenever possible.

> *MIS budgets are showing a 23% annual increase in communications equipment and services.*

For Robert Olsen, director of information services at Fluor Engineers, personal computer-to-mainframe communications has created a security headache. "I use my off-site storage to keep a copy of every program used in-house. Then we date and time stamp them," he explained. "It's a stopgap approach."

Lay lists software maintenence as his biggest problem, while Carman is trying to crush a number of glitches resulting from trying to get a number of different vendors' mainframes to communicate with one another. "Actually, we have IBM and Sperry Corp. mainframes and Digital Equipment Corp. and Hewlett-Packard Co. minicomputers, so it's really a problem with communications between dissimilar mainframes and minicomputers," Carman clarified.

He bemoaned the fact that he has not yet seen an off-the-shelf product that allows intelligent communications between his company's message switches. "We've worked out some local code between the Sperry and IBM machines," he explained, "but its access methods are outdated and undocumented."

Service is a problem for Martin: "International Paper is mainly an analog-dedicated line shop, going out to all our facilities from two of our computer centers. The problems we have are with the local loops. Our local carriers don't have enough experienced people to deal with it."

MIS budgets in corporate America are showing a 23% annual increase in communications equipment and services, compared with an 11% annual increase in data processing hardware costs, according to a report from Comdisco. Martin sees this as a clear indication that the integration of voice and data will become an economic necessity in the coming years.

Overall, there is no question that communications is becoming very important to corporate life and survival, more so than just a few years ago.

"There's just been an awakening by upper management for the need to communicate with our vendors and with our customers," Inderhees at Champion explained. "They're viewing communications as a strategic direction for the company. However, they are also becoming aware that it's not the communications medium itself, but rather what is communicated that is important.

"They're not blinded by the technology anymore."

Kolodziej is a senior writer at Computerworld Focus.

TECHNOLOGY TRENDS

What's Ahead In Communications?

·BY·KIM·MYHRE·

T

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TECHNOLOGY TRENDS

The high-growth markets of the communications industry are intelligent gateways and servers, communications software including micro-to-mainframe links and network applications software, local-area networking gear, private branch exchange (PBX) add-on equipment such as data interfaces and Integrated Services Digital Network (ISDN) terminal equipment, line consolidation devices like port contention and matrix switching equipment, fiber-optic links, T-1 carrier facilities and equipment and many other technology areas.

For reasons limited not only to economic incentives, both vendors and users will embrace a new generation of communications technologies over the coming years. Many of these technologies will have a major impact on how vendors do business and users handle information.

The migration to new technological solutions, however, will not happen overnight. The market as a whole must suffer through a period of transition as users mix new technologies with installed investments while vendors reevaluate their product strategies and venture into new business opportunities. To examine the characteristics of this period of technological transition, you only need look at recent developments in the area of on-premise networking.

> *Many of these roadblocks to local-area network proliferation are now beginning to give way as the market begins to get on with the sedate issues of implementation.*

Of all the areas of communications technology development, local networks offer particularly significant promise for the development of cost-effective methods — methods that maximize the capabilities and usefulness inherent in a new generation of information processing and storage technology.

Yet, despite the potential benefits provided to organizations through its implementation, many users have been hesitant to commit to a local-area network solution. Much of the timidness on the part of users to acquire local-area networks has been inspired by ongoing arguments between equipment vendors over many areas of concern.

These concerns include technological issues: confusion over standards, multivendor environments and systems incompatibilities; lack of standard network software; absence of an IBM local-area network solution; and changing organizational management for telecommunications and MIS functions within many user organizations.

Many of these roadblocks to local-area network proliferation are now beginning to give way as the market transcends some of its earlier marketing hype and begins to get on with the more sedate issues of implementation.

While there still exists considerable technological debate over the advantages and disadvantages of various local-area network approaches, there has been some consensus that many different types of local-area network technology will coexist in the marketplace and even within a single customer premise. Most of the dynamic debate remaining centers on issues of premises wiring, network operating systems software and network systems standards.

Because there is currently much sensitivity to standards as users attempt to integrate multivendors' systems, there is a tendency to develop standards very early in the market development cycle. This has certainly been the case with local-area network standards. The IEEE 802 Committee set about the task of developing local network standards before local nets had even been installed in customer facilities. In some cases, this was done even before the local net was available, as in the IBM-endorsed 802.5 token-ring standards.

Those local-area network products that were available during the standards development process were for all practical purposes nonstandard networks because no standards had yet been established. Obviously, many users chose to wait out the standards process to ensure that the local-area network they ultimately implemented would comply with a de jure standard. This situation put a damper on local-area network sales over the past couple of years. IEEE 802 standards for physical and data link layers have now emerged. In fact, multiple standards have also arisen.

Yet even with the evolution of the IEEE 802 low-level standards, issues of multivendor compatibility have still not been resolved. While it is possible to physically connect multivendor equipment to a standard local-area network, it is still usually not possible to make incompatible systems communicate. The challenge for users and vendors of multiple local-area network systems and/or local-area network/PBX combinations is in the area of physical and logical network integration.

TECHNOLOGY TRENDS

How do we integrate multiple network systems environments often supported by different network technologies and usually running incompatible operating systems and software into a cohesive system? We are already beginning to witness heightened user interest and vendor product development in this area. Gateways, bridges and sophisticated network servers are now beginning to emerge, all aimed at addressing this important issue of integration.

There is still a long way to go before user organizations will be able to link multiple systems environments efficiently. However, the availability of gateway, bridge and server technologies represents an important opportunity to plan for systems migration and resource consolidation. From the vendor's view, such products represent a new and potentially lucrative business opportunity.

> *While the ability to integrate data, text, image and voice applications from competing vendor systems is still several years away, there has been some movement toward the development of standards during the past year. Continued development of standards for integrated, multivendor network architectures will be one of the most rapid areas of technological innovation to watch this year.*

There will be significant announcements in network gateway technology over the next year as user organizations continue to demand solutions for network and system integration, while at the same time vendors begin to reap the rewards of this high-demand, high-margin business area. However, users should carefully consider network interconnection based on specific requirements and available functionality.

Gateway solutions can often be quite expensive. While 3274 emulation capabilities can be added to most networks for a few thousand dollars, file-transfer gateways between departmental office systems, such as Digital Equipment Corp.'s All-In-1 on a VAX and IBM Distributed Office Support System (Disoss) on an IBM mainframe, can cost anywhere from $30,000 and up.

Because the mapping of protocols between dissimilar systems is extremely complex, conversion will require significant processing power. High-volume links between networks will in many cases require a dedicated minicomputer to handle gateway processing requirements. As a result, it will not be surprising to see the emergence of a new market for sophisticated, minicomputer-based network servers to be born from mergers like that of 3Com Corp. and Convergent Technologies, Inc.

Even in light of these trends, the development of standard network software still remains the biggest stumbling block to the most effective use of local-area networks. In the terminal and systems local-area network market, most network operating software still remains proprietary to the primary systems environment. For example, DEC offers Decnet, Xerox Corp. offers XNS and IBM offers Systems Network Architecture (SNA).

There has also been a move by large customers toward influencing vendors to support customer-specified network operating environments. For example, the Department of Defense requires Transmission Control Protocol/Internet Protocol (TCP/IP) support and General Motors Corp. requires Manufacturing Automation Protocol (MAP) compatibility. However, despite the International Standards Organization's (ISO) open systems interconnect (OSI) rumblings, no real standard network operating environment across vendor product environments exists as of yet.

Continued development of standards for integrated, multivendor network architectures will be one of the most rapid areas of technological innovation to watch for during the upcoming year. While the ability to seamlessly integrate data, text, image and voice applications from competing vendor systems is still several years away, there has been some movement toward the development of standards for multivendor networking during the past year.

For example, in the personal computer local network area there does appear to be movement toward de facto standardization around the Microsoft Corp.-developed MS-DOS 3.1 and IBM's PC Network protocols. A large number of personal computer local-area network vendors have announced they will support these protocols on their network

products. The anticipated result of such standardization is the hoped-for availability of local-area network applications software and the implementation of site licensing of such software.

Meanwhile, IBM has become even more aggressive in the propagation of standards for data and text applications and networks integration in the intermediate and mainframe systems environments. Adoption and implementation of IBM's SNA, Advanced Program-to-Program Communications (APPC), Document Content Architecture (DCA) and Document Interchange Architecture (DIA) text standards have been gaining momentum, and IBM compatibility has become a more important criteria for competing vendor architectures.

In fact, IBM architectural standards have become what competing systems manufacturers have in common despite continued support for their own proprietary architectures. DEC; Wang Laboratories, Inc.; Data General Corp.; AT&T; and Hewlett-Packard Co. have each announced products to support IBM interconnection and compatibility while at the same time strengthening their own proprietary network solutions.

Much of the networks standards development activity has also centered around the ISO's OSI model. Most systems manufacturers, including IBM and DEC, have committed some level of support for OSI. And yet, while many users would like to implement OSI standard networks, the real world of 1985 offered little hope and almost no products. Relative to the development of proprietary networks, OSI got a late start and has progressed slowly. At this point, only the three lower layers of the seven-layer OSI model have been defined. The higher levels have been loosely outlined and guidelines have been established, but no specific protocols have yet been defined.

OSI is important, however, as the model sets parameters for vendor product development as well as provides users with a measure to gauge the extent of a vendor's commitment to open network solutions. Vendors will move to embrace OSI (if for no reason other than OSI's marketing value); however, such compatibility will remain a costly add-on feature. Vendors will provide gateways to both SNA and OSI in a way that will enhance and protect their own proprietary architectures.

Despite the hectic activity of vendors, it is the user's ability to plan, implement and manage new communications technology solutions that is inarguably the most important factor in a vendor's ability to move to higher-margin, new technology areas.

The rapid-fire introduction of new hardware, software and service options has confused and complicated the customer's planning and selection process, while at the same time offering the customer important opportunities for more cost-effective information systems and services. User organizations feeling an urgency to take advantage of these new opportunities are becoming more proactive in efforts to sort through the maze of technology options and vendor claims.

> *The rapid-fire introduction of new hardware, new software and new service options has confused and complicated the customer's planning and selection process.*

One of the most interesting challenges inspired by the emergence of new types of systems integration technology has been the integration of telecommunications and data processing management. Many organizations are now emerging from this management challenge with very clear charters to develop communications-based integration strategies to support organizationwide objectives.

User organizations are ready, willing and able to acquire new communications technology solutions, but they are looking for ways to utilize this technology to maximize installed technology investments — not start over. Very few organizations have the luxury or interest in replacing existing systems or developing new, separate systems just because vendors have announced products that afford them higher margins.

Vendors will find that prospects and customers are becoming more sophisticated in their ability to plan, acquire, implement and manage information systems and will be far less likely to buy vendor claims hook, line and sinker. Those communications and data processing equipment firms that are not able or willing to provide such integration tools to their customers will continue to suffer from the weight of the economy. F

Myhre is director, communications industry research programs, International Data Corp. in Framingham, Mass.

MARKET ANALYSIS

For Whom The Bells Toll

·BY·ROBERT·F·CAMPBELL·

The postdivestiture period has been one of rapid growth and change, a catch-up and get ready period. But the new market is emerging from growth problems that have driven it erratically on a year-to-year basis, with pitfalls for those who attempt to project from the past to the future. However, estimates of its long-range potential as "everyone's growth market" remain intact.

Telecommunications in 1986 will continue to stabilize toward a period of vendor shakeout and consolidation, but will be driven by the following three key factors: technology, the end user and principal participants.

The supply and demand formula is applicable to any open and competitive market, but time is required for the formula to take hold, particularly in a telecommunications market that had been dominated by a single participant as well as regulated for a long time. In addition to its problems of deregulation, technology is going through a major change — from electronic to optoelectronic to photonic — with a move in process to fully-integrated optical and electronic networks. This subevolution will be a key factor in 1986-87, with new generations of optical switching and processing, storage, terminal and transmission systems emerging and the continuing move toward more bandwidth, storage capacity and processing speed (toward the gigabit and picosecond).

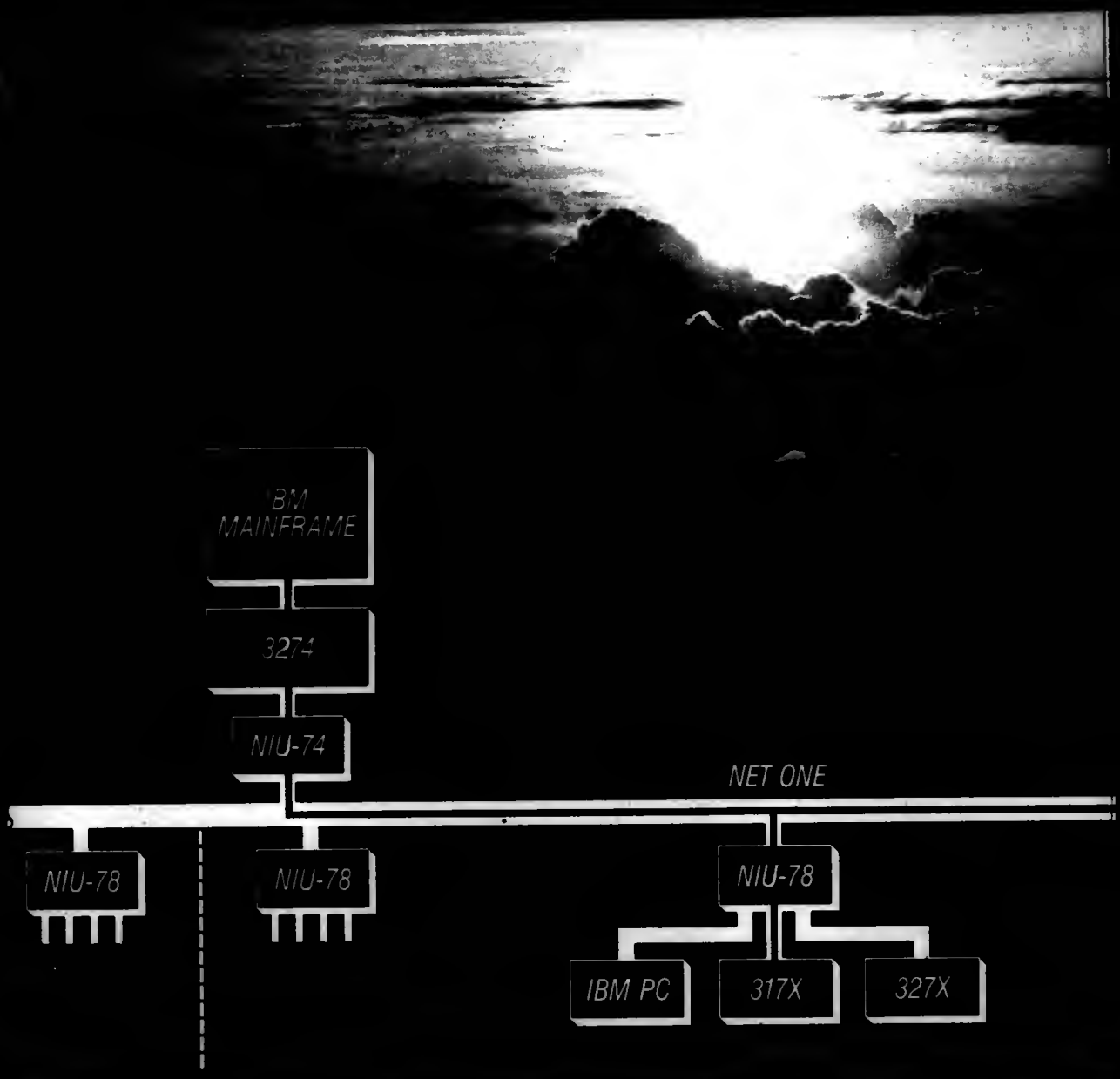
The end user is the key to the market. Of the three types of telecommunications end user (mobile/personal, residential and corporate), the corporate end user has initially been driving the market by buying or not buying. As the market changes from five previously separate types of services and networks provided by five separate industries and markets to one Integrated Services Digital Network (ISDN), the end user is caught in the middle of this market change. The end user is attempting to absorb the change and the new market basis for competition.

The ISDN confronts the corporate end user with several problems that will take time to resolve. The first problem is the need for planning, implementing and operating an ISDN, which are awesome changes in many cases. Essential communication links cannot be disrupted. The implementation must often be migratory and in slow, manageable steps. Most important, a new strategy and organization must be established to implement the change.

The ISDN is an essential part of a corporate information resource and requires an information resource management organization and a new three-prong telecommunication network organization. The planning and conversion must migrate five networks and services into one ISDN for voice, electronic data processing, automated office, building and management services. The plans and implementation schedules must be in place before the end user will freely buy replacement and enhancement systems. Moreover, the corporate end user will prefer to buy from a complete information and telecommunications vendor — one-stop purchasing. The market must wait for as well as adjust to the end user.

The postdivestiture environment has created a dilemma. The end user wants advances and enhancements and new technology quickly converted to market products and services. The vendor, on the other hand, attempts to respond to these end-user requirements by investments in research and development and rapid conversion of this technology in the manufacture of new products. But this causes the end user to hesitate to purchase — to delay and wait for the new generation in order to guard against rapid obsolescence and assure a reasonable residual value over a feasible period for the investment. Hedging has caused erratic market actions over recent years as telecommunications technology moves forward.

The year 1986 will begin a period of activity and consolidation. There will be movement away from incompatible devices and systems and toward the development of standards and an ISDN.



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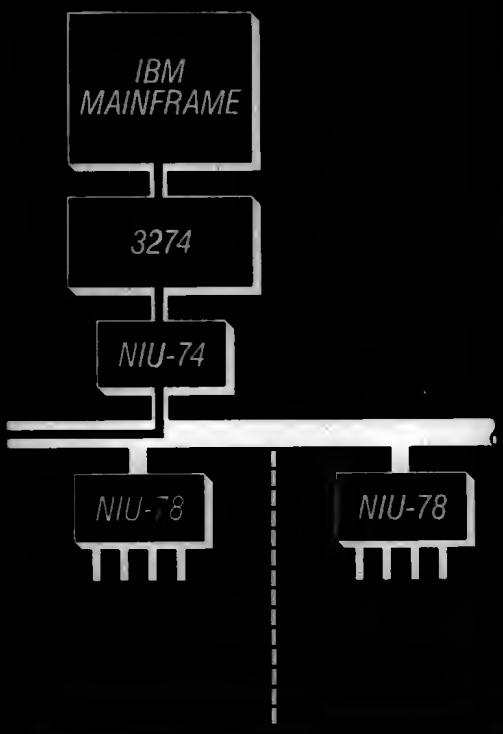

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CIRCLE READER SERVICE NUMBER 10

MARKET ANALYSIS

ISDN will evaluate the five services — voice; electronic data processing; automated office; building and process management — over a single digital network as a conceptual end state towards which the end user can migrate with an individual implementation plan.

Components of the ISDN can evolve and be replaced with more advanced systems without displacing the ISDN. Thus, a transmission system can be replaced, a more advanced distribution system or integrated voice and data terminal can be used and communication processors can be replaced, all without supplanting the ISDN and in a migratory, nondisruptive fashion.

The burgeoning acceptance of the conceptual ISDN approach by end user and vendor will be a major factor in stabilizing the information and telecommunications market in 1986.

The telephone companies — AT&T and the large independents — had a virtual monopoly until deregulation. In a deregulatory market through the 1970s, other carriers such as MCI Communications Corp., GTE Sprint Communications Corp. and interconnect equipment manufacturers gained steadily in market share at the expense of AT&T.

AT&T voluntarily divested its Bell operating companies through 1983. It grouped them into seven regions known as regional Bell operating companies, which formed regional holding companies.

These regional holding companies retained the traditional telephone operating companies. They were allowed by the District Court supervising the divestiture to develop separate unregulated subsidiaries with certain restrictions. These subsidiaries had no geographical boundaries. Some of the restrictions limiting the lines of business these subsidiaries could conduct have been relaxed through waivers issued by the District Court's Judge Green, based on requests from the regional holding companies.

The regional holding companies were divested through 1983 and hit the street running in the first months of 1984. They have the advantage of an already established business producing very substantial resources. However, they have awesome problems adjusting to a competitive market, in a new competitive relationship with the restructured AT&T and under court restrictions (which will probably continue to be relaxed).

The real problem for a regional holding company or any new participant in a competitive market is to gauge the end user's buying preferences properly. The line up of participants must begin with the two Goliaths of AT&T and IBM confronting one another and sparring for the lead position, one step at a time.

Acquisition is a clear strategy for these resourceful two; IBM acquired Rolm Corp. to enter the PBX/communications processor market and partly acquired an MCI fortified with Satellite Business Systems for entry into the carrier market. The next move is up to AT&T; it will most likely be shopping for an electronic or automatic data processing manufacturer or possibly an acquisition to strengthen its international position.

The seven regional holding companies are each in similar positions, yet different in their strategies. They each must maintain and build on existing customer bases in their traditional regions, for both a regulated business and a new unregulated competitive and expanding information and telecommunications business. As one holding company moves into another's traditional territory, the other regional holding company may respond in kind.

The regional holding companies will organize new subsidiaries or jockey for position and market share in a market striving to keep up with developments and end user needs.

The interconnects of old and a growing additional group of other common carriers and value-added networks, new equipment and service producers and system integrators and contractors make up the remainder of the participants. They will utilize acquisition, merger and teaming strategies in an attempt to compete successfully in the new ISDN environment.

Telecommunications '86 will be impacted by advancing technology, the buffering effect of an ISDN concept in the implementation and procurement planning of the end user, the development and offering of new products and services by the vendor, the end users' attempts to adapt and absorb the changes and the strategies of the vendor participants as they affect one another and the market. The year 1986 will see further development and introduction of advanced technology devices and systems — particularly optical and optoelectronic-based systems — but in an ISDN end user framework and as compatible/replaceable components in open networks.

Vendors will continue to develop new areas such as resale, shared tenant services and network management systems in the search for entrepreneurial advantages in niches and crannies of the telecommuncations market. Of critical significance to their future will be the 1986 regional holding companies' strategies. The regional holding companies have had two years to get ready since divestiture. Their options in marketing strategy can emphasize each of three geographic market places: their traditional customer base in their operating telephone company region (and the locations elsewhere for regional corporate customers), the remaining domestic marketplace (which could mean direct confrontation or arrangements with other regional holding companies) and the strange new and growing international market. International business may be further promoted.

Above all of these driving factors and trends that impact telecommunications in the coming year is the overriding information automation evolution that is mandating a generation of integrated optoelectronic networks. This should cause 1986 to be the first of the light years.

Campbell is the vice-president of International Optical Telecommunications in Centerville, Mass.

FOCUS ON NETWORKING

A Look at IBM's Token-Ring Network

DAVE RIDLEY

·BY·BRIAN·JEFFERY·

Enter IBM's Token-Ring network, and the world is different. IBM's announcement last October was followed by a barrage of third-party local-area network vendors introducing Token-Ring interfaces and compatibility. The Localnet and Comdex/Fall '85 shows were dominated by the Token Ring, and the next few months saw one vendor after another joining the Token-Ring bandwagon. Not only did IBM commit massive technical resources to the Token-Ring over its six-year development history, but the company carefully stage-managed its market entry to achieve large scale third-party support and publicity. Aggressive pricing and open architecture helped. The Token-Ring obviously matters to IBM.

Why, though? The company is not going to get rich from $695 adapters, and even the full range of Token-Ring software and servers is likely to represent only a small component of its large account revenues for a long time to come. Moreover, IBM has generously supported third-party local-area network competitors in developing compatibility and interfaces, has turned most of the cabling and installation business over to other companies and the OEM token-ring interfaces are supplied by Texas Instruments, Inc., not IBM itself. For IBM, establishing the token-ring standard is obviously the key priority, not selling token rings.

The answer has much to do with Systems Network Architecture (SNA) and even more to do with twisted-pair cabling.

The token-ring architecture is basically a derivative of SNA and is described by IBM as an implementation of the SNA providing a higher-speed, peer-to-peer communications infrastructure operating at the equivalent of the lower SNA layers. From the beginning, IBM has treated the system as an extension of the SNA environment. It is part of the broader enhancement of SNA that has come to include the Logical Unit 6.2 standard (LU 6.2), the Document Interchange Architecture/Document Content Architecture (DIA/DCA) text complex, 3270 Extended Data Stream, Scanmaster image-processing and the multiple host session technology implemented as multiple host windowing on the IBM 3270 Personal Computer line and the IBM 3290 plasma display.

In the future, IBM has indicated that SNA will also be expanded to incorporate voice traffic and to support Integrated Systems Digital Network (ISDN) communications.

The reasons for IBM's SNA emphasis are basic to the company's long-term strategies. IBM has put a lot of effort into looking at the future of the large account marketplace, and the company is very conscious of the large-scale growth in information traffic likely to occur here in the future. For IBM, it is vitally important to capture this growth under the SNA umbrella, ensuring that personal computer integration occurs under SNA protocols, voice/data integration occurs from the data processing rather than telecommunications sides of large organizations and IBM large account revenue streams are maintained and expanded into the 21st century. With the slowdown in its computer markets, ensuring this process is increasingly important to IBM if it is to meet its long-range growth targets.

Few would doubt IBM's prospects of success, and most of the industry tends to regard IBM as unbeatable. There is thus more than a little irony in the fact that the largest threat facing IBM in this market is something as apparently humble and inconsequential as twisted-pair wiring for telephones. IBM's problem is that there is a vast amount of the stuff out there already installed. In the average large end-user organization, there is typically a profusion of IBM 3270 point-to-point coaxial and twinaxial cabling for systems such as the System/36 or System/38. IBM already controls that to a greater or lesser extent, and for new buildings IBM has been quite successful in persuading end users to install the more expensive but more reliable shielded cables of IBM Cable System, Types 1 and 2.

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That still leaves the rest. Telephones are connected over unshielded twisted-pair wire, the vast majority of personal computers communicate in the same way and similar ASCII device links pose a problem for IBM in that the growing popularity of IBM 3270-PC protocol conversion systems could all too easily undercut much of its 3270-PC emphasis. Allowing for the different types of IBM coaxial and twinaxial cabling and for the existing base of coaxial local-area network systems, it is still clear that over 90% of end-user devices in large accounts are still up for grabs.

IBM was late to recognize the implications of this. In its original token-ring plans, IBM seems to have regarded its main competitor as Ethernet and its counterparts, dedicated local-area network systems operating over coaxial cable. This perspective translated into a strategy based on the assumption that a local-area network system was essentially something that you rewired for. Of course, IBM did not have a great deal of choice in the matter when it came to the Token-Ring local-area network.

Supporting the 4M bit/sec and 16M bit/sec channel rates of the system and its complex protocols required shielded twisted-pair cabling at the very least if any real distance was to be possible. As the October 1985 announcement of IBM's Type 3 cable showed, the token ring cannot run more than 100 meters over standard telephone cabling.

Nevertheless, IBM clearly thought it was going to develop an edge over other local-area network vendors with superior cabling. IBM's combinations of optical-fiber and twisted-pair cabling were going to be a lot more attractive than coaxial cabling.

Then the doubts set in. The original IBM Cabling System circa 1983 consisted of four rather than two main cable types. There was Type 1 (two shielded data pairs and four voice-grade pairs) and Type 2 (two shielded data pairs) that were announced in May 1984, and Type 3 (Type 1 with optical fiber) and Type 4 (Type 2 with optical fiber) that weren't announced.

IBM seems to have backed off from its optical fiber commitment by this time and to have become preoccupied with twisted-pair cabling. IBM's shielded twisted-pair cabling options, which were introduced in May 1984, were offered only for new buildings, and it is clear the company had by this time already recognized the competition had changed. IBM was looking less at coaxial local-area network vendors and more at the likes of AT&T and Northern Telecom, Inc.

These companies had come out of left field with local-area network technologies and architectures operating over standard telephone cabling and thus they were a lot easier to implement in existing facilities. The extent of IBM's concern was reflected in the $1.2 billion it spent to acquire Rolm Corp., the crash effort to support the Token-Ring network on unshielded telephone cabling and the launch of the remarkable program supporting the independent local-area network vendors in developing Token-Ring compatibility. It later transpired that IBM had been working closely behind the scenes with the likes of Ungermann-Bass, Inc.; Corvus Systems, Inc.; 3Com Corp.; Nestar Systems, Inc.; Bridge Communications, Inc.; Novell, Inc.; and Proteon, Inc.

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In a rather curious turnaround, the coaxial local-area network vendors were being enlisted to support the Token-Ring local-area network standard against the Private Branch Exchange (PBX) vendors, who by now had emerged as a more serious threat to IBM's plans. IBM was always committed to an open architecture for the Token-Ring to ensure rapid acceptance as a standard. That IBM went so far as to help its competitors and hedge its bets with a Rolm CBX II-based scenario owes much to the fact that the Token-Ring doesn't work very well on telephone cabling. This would not have been too serious for IBM if there had not in the meantime emerged a field of vendors who offered systems that did.

The bottom line is that IBM's local-area network strategy has left a yawning gap in its market coverage. This picture is confirmed by some recent surveys.

First, there is the IBM Cabling System as announced in May 1984. IBM claims upwards of 70 million linear feet of Types 1 and 2 cable installed, and this is supported by the IBM Cabling System distributors and design and installation services firms. The vast majority of this

cabling has gone into new buildings, with only small amounts going into rewiring, usually by organizations installing a trial configuration on a single floor or in a small facility.

The typical IBM Cabling System user is a large IBM data processing shop moving into a new facility and putting in over 50,000 linear feet of IBM cabling. Virtually all of these need to support IBM 3270 PC devices, and over 60% also report System/36s and other IBM systems with twinaxial cabling. The single most important motive cited for installing IBM cabling systems was the ability to dispense with older coaxial and twinaxial cabling for IBM systems.

Despite some criticisms of the cost of the IBM cabling, it is generally regarded as a safe option, and cost factors tend to take second place to the concern with providing a long-term viable cable plant. (IBM has been describing the IBM Cabling System as adequate for thirty years' growth in information traffic.) With IBM support guaranteed, most of these end users regard the cost as tolerable. IBM has been losing very few of its large data processing end users who are moving into new facilities. IBM Cabling System end users cover a wide spectrum of industries and facility types, with the main correlation being with a committed IBM data processing shop with large 3270 PC bases and twinaxial cable systems. Interestingly, support for personal computers appears to have been a factor for relatively few end users in selecting the IBM Cabling System.

If the IBM Cabling System is doing well with this group, its reception elsewhere in the marketplace is mixed. The only end users with a serious interest in rewiring with IBM cabling are a minority of large sites. These are typically university campuses and corporate sites with a large number of buildings where there is a realistic economic justification in large-scale rewiring. The majority of large end users, even those that qualify as committed IBM data processing shops, do not see much mileage in putting in new cabling. Fewer than 20% see themselves doing any serious rewiring with the IBM Cabling System, and even among these there are many doubts about the viability of the IBM approach.

Reception of the IBM Cabling System is, however, substantially better than that for the Token-Ring network. A wait-and-see attitude continues to characterize MIS departments, and even many of these end users who have installed IBM Cabling Systems have doubts. Almost without exception, end users are skeptical about the system and reluctant to commit until far more of the system is seen and some practical experience with it is apparent. Close to three quarters of surveyed MIS departments report they might use the Token-Ring network, but only 12% appeared serious about it.

The biggest stumbling block to token-ring commitments

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nght now is cabling issues. Few end users want to rewire, and the 100-meter distance limitation with standard telephone cabling is proving a serious negative. To convert to the Token-Ring network over this medium is commonly felt to require rewiring, and even the aggressive pricing of $695 for a token-ring attachment is not cancelling out this effect.

IBM being IBM, though, the company has gone in with an ace up its sleeve. IBM as a token-ring vendor has more trouble than the token-ring architecture itself does.

The difference has much to do with how IBM has dealt with third parties. That aspect rather than the company's own actions may prove to be the most important part of the token-ring phenomenon. In working with the leading independent local-area network vendors, IBM has achieved the remarkable coup of having most of its competitors promote its product. The IBM introduction of its Token-Ring network in October of last year was followed by a barrage of third-party announcements of compatibility and outbreaks of token-ring fever at the Localnet show and Comdex.

Almost overnight, the Token-Ring has been established as the key standard in local-area networks, a considerable achievement bearing in mind that IBM has shown little and delivered nothing. Most of the independent local-area vendors and a growing number of other systems and software firms have jumped on a bandwagon that has, in a few months, developed more momentum than Ethernet achieved in five years. One firm, Nestar Systems, Inc., has already moved to selling IBM Token-Rings, and others are likely to follow during 1986.

Channeling so many third-party resources into the token-ring architecture is likely to have some major effects on the direction of the local-area network business. The Ethernet system, the nearest thing to a pretoken-ring local-area network standard, owed much of its success to the combination of an open architecture with the efforts of individual developers focusing on particular applications or environments. The same, rather obviously, is now going to happen with the Token-Ring architecture. Before it is over, we will no doubt have token rings on broadband and baseband coaxial cable, alternative twisted-pair token rings, improved token rings, specialized token rings and — last but not least — token rings that perform better on standard telephone cabling. Regardless of what IBM itself achieves, third-party vendors and developers are going to ensure substantial market penetration.

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This is vintage IBM. After failing to address the PBX marketplace with in-house efforts, IBM bought Rolm. After Satellite Business Systems performed poorly in the long-distance telecommunications marketplace, IBM bought into MCI Communications Corp. For its cellular radio system, it went to Motorola, Inc. To handle Integrated Services Digital Network (ISDN) techoology, IBM recently announced it was looking for a partner in this area. For its PC Network, IBM went to Sytek, Inc. For an industrial local-area network, it went to outside developers and standards.

This time, however, IBM has outdone itself. It has mobilized the resources of all the major local-area network vendors to make up for its own design shortcomings, an achievement no other vendor could have managed and which is likely to have a more important competitive effect against the PBX vendors than anything IBM could have done itself.

The effect is likely to be very similar to that which occurred with IBM's PC line, with the third-party community substantially increasing IBM market penetration and probably doing quite well for themselves in the process. For end users, it is going to mean in the long run that the safe IBM local-area network option will be presented in some more palatable forms. This improves the Token-Ring's market prospects, but IBM is still short of winning the game.

Standard telephone cabling is still an area in which the PBX vendors have a head start. IBM's token-ring network will run up to 100 meters over this medium. IBM's third-party local-area network supporters are still typically selling coaxial systems for well-defined environments and limited installed bases. Much will now depend on whether the PBX vendors can mount an effective challenge to the Token-Ring bandwagon and adequately penetrate the standard telephone cabling base.

It is going to be a very high-stakes game. IBM's Token-Ring push represents a threat not merely to established local-area network standards such as Ethernet and Arcnet but also the emerging PBX-based systems from AT&T, Northern Telecom and other telecommunications vendors. Their position is a combination of strength and weakness. The Token-Ring standard is currently vulnerable in its poor support over standard telephone cabling, but it will take more market momentum and better coverage of the MIS environment and its concerns if a counterbandwagon is to be built up. In the face of IBM's Token-Ring push, those supporting alternative methods and strategies are going to have to hang together. If they don't, they will surely hang separately. F

Jeffery is director of research at International Technology Group, a Palo Alto, Calif.-based research and consulting group specializing in the computer and communications industries.

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Coping With Network Security

DAVE MOLEY

·BY·STAN·KOLODZIEJ·

A data base in a large Northeastern bank contained biographies of the bank's top executives. One night a bank employee used his microcomputer to gain access to the data base and alter the biography of one of the executives. When a newspaper requested the officer's biography, the computer printed out the false and derogatory one. Only the sharp eye of a secretary saved the company embarrassment and red faces.

A certain oil company was consistently being underbid on Alaskan oil leases. Puzzled, but suspecting foul play, the company launched an intensive internal investigation and discovered that an employee had been using a microcomputer to gain access to sensitive corporate data that had been left on microcomputer hard disks systems.

"Three years ago, security on micros was never a thought," explained Mike Schwartz, vice-president of Prime Factors, Inc., an Oakland, Calif., consulting firm. "Now it's an afterthought. In a few years, security will be thought of as part of the entire microcomputer package, before installation."

Directors of MIS are increasingly becoming more aware of security for microcomputers and local-area networks and are taking a firm look at what information should be available to which micro users.

But it's not an easy task. Security controls on micros are turning out to be a difficult bag of tricks to handle. Control over program changes, data security, system documentation, data backup and recovery plans are an inherent part of most mainframe installations. Not so with micros, and the push toward local-area networks and micro-mainframe links is dramatically bringing the problem of securing micros and networks into the open. The problem of micro data security is exacerbated by most organizations "not knowing who is using micros and lacking a reliable system of knowing which users are interfacing with the mainframe," according to a recent research report from Datapro Research Corp., Delran, N.J.

Local-area networks are difficult to secure. There is the danger that any micro or node on the network has the inherent ability to read any message being carried on that network. "Networks are broadcast media. They were designed to carry information, not conceal it," according to Jay Weil, manager of product marketing at Excelan, Inc., a maker of network products located in San Jose, Calif.

More corporate micro users are also beginning to wrestle with the sobering reality that micro security threats are more likely to come from inside the company, not from the outside as is generally believed.

At the General Electric Co. plant in Binghamton, N.Y., Phil Mateo, systems engineer, is expanding the company's local-area network from 60 micros to 100. (The network's security protection software was purchased from the same network vendor who sold the hardware components.)

Information resident on the network consisting of sales data as well as customer and competitor profiles is of a nature so sensitive as to warrant security measures, Mateo said. With the network expanding so rapidly, however, Mateo said the vendor's password protection software is becoming less flexible. Like much of the software security being offered by local-area network vendors, Mateo's password protection does not extend down to the subdirectory levels of micro data bases on hard disks. The assignment of level access is also becoming a problem, Mateo said, because of the complicated variables involved of assigning more people to more access levels of data. "If an accountant has been assigned access to route levels up to 45, and it was suddenly necessary for him to access an engineer's files above 50, he's out of luck," Mateo explained. "In a way, the more people on the system, the greater the security limitations."

In the meantime, Mateo is making sure his network is a closed one. The original plans called for dial-in capability from the outside, but Mateo claims he has found no

vendor offering adequate security against breaking into a file server or gaining control of a microcomputer on a network. Instead, Mateo is screening some of the few available programs that run on mainframes but fool a microcomputer into thinking the program is on its resident disk.

Though many vendors of local-area networks offer password protection as a built-in feature, password use on local-area networks as a means of user authentication is fraught with limitations. Users will balk at all but the simplest of password combinations which make them easy targets for serious security threats. As an option, network vendors will usually supply a second tier of data security for communications in the form of encryption or coding of data, usually employing the U.S. government-developed Data Encryption Standard. "There is no real way to secure a [local-area] network now," according to Jay Weil of Excelan. "Encryption is all right between a small number of people, yet it is still risky. And once you spread the responsibility, you spread the security risk."

Encryption for transmitted data is usually an automatic process. An expansion board on the sending computer scrambles the data, while a board on the receiving computer decodes the data. To add extra security, many companies require that sensitive files also be encrypted on disk, but in a local-area network environment with its multiuser interchanges, such single user encryption key systems are generally inadequate. There are exceptions. Autocrypt from Jones Futurex, Inc. of Fair Oaks, Calif., for example, encrypts all data stored on microcomputer disk as well as the data stored on disks controlled by a file server.

Weil added that outside of highly specialized financial applications where a steady stream of sensitive data is transmitted to and from various points, wholesale encryption is not necessary and barely feasible. "Encryption from the file server is difficult, and there are no black boxes that I know of that can sit between servers and computers to handle instantaneous encryption as the data comes over the line. Security on local-area networks by way of encryption is still a case of limiting access to individual users."

A final annoying problem with encryption devices is their sluggishness. Mateo at GE said he was staying clear of encryption because "it slows you down."

The local-area network industry has become very competitive in recent years. To stay competitive, costs have to be kept low, and one way to keep them lower is to avoid building in hardware and software security unless it's specifically called for by customers. To date, however, customers have kept security low profile, and vendors have followed suit. Pressure for better security in local-area networks could, however, now be building.

Steve Glagow, a senior consultant with Walter Ulrich Consulting, Inc., Houston, indicated that from his work with corporate clientele, more companies at least seem to be more aware of the need for microcomputer security.

"Unfortunately, we've also located a real dichotomy," Glagow explained. "While over 40% of our clients want the security features, only about 5% said they will actually use it. In the end, it seems most companies still think security breaches will not hit them."

Glagow does think a couple of years will make a big difference. Apart from learning by example, Glagow said he senses a general process of education underway on the part of executives. They are beginning to understand that the spread of local-area networks and gateways to remote networks are creating major gaps in their existing mainframe and micro security measures.

Glagow's firm put together some projections concerning the size of the still young and little known market for local-area network security. Glagow sees the size of the U.S. market for inbred network security, which is estimated at $27 million for 1985, as reaching $74 million by 1987, then rising dramatically to $114 million by 1988 (the year Glagow deems pivotal in the microcomputer security area overall). By 1990, he projects a local-area network security market of $315 million.

Many government installations and financial institutions are obvious sites. Another natural market is developing in reaction to tighter privacy laws to ensure client confidentiality, placing pressure on credit bureaus, insurance companies and medical facilities. Yet another security stimulus comes from the fear of industrial espionage.

While such applications still account for the brunt of local-area network security measures, other less sensitive installations are gradually being perceived as potential targets for security breaks. Pam Gilbert, special purpose computing manager at Codex Corp., a Mansfield, Mass., maker of computer modems, explained that budget and personnel data in her firm were now being secured on microcomputers. This is being done in part because micro security products were becoming better and cheaper.

"We find our clients want more encryption and things like audit trail facilities," explained Charles Johnson, vice-president of marketing at Proteon Associates, Inc., a Waltham, Mass., local-area network vendor. "We're seeing the market base open up from just the financial and government clients."

Johnson added that Proteon Associates supplies consulting services on security should a customer need more than the password user authentication methods his company provides with Pronet network file server. "It's not so much a

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question of how much security," Johnson explained, "but exactly what data customers want secured."

Dial-up access to mainframes from micros also creates a special security problem, though not insurmountable. One consulting company, Data Bank Associates, Inc., Germantown, Md., arranged for a client, a large communications company, to set up procedures whereby micro files are automatically uploaded via communications software to the company's mainframe. "Our client had lost programs and learned the hard way," Edward Rosen, Data Bank Associates president, explained.

Another real security threat to networks results from equipping one or more workstations with modems in order to act as gateways for certain employees to dial in and access information. "Once someone who is unauthorized gains control of a gateway workstation, that person can be in a position to cause real damage to the network," explained Marc Veeneman, president of Marcal System Corp., a consulting firm in Cary, Ill.

Though password protection lessens the dial-in security threat, passwords can easily be broken. There are programs available that can break the connection with the caller after a certain number of invalid password calls are made. Still more sophisticated programs are coming onto the market that require the caller to use a password and hang up. The system then calls back using a number associated with the password. "That extra level of security can mean all the difference," Veeneman emphasized.

Instead, consultants often instruct corporate network users to limit the storage of sensitive data on local-area networks. If possible, they are told data should be uploaded automatically to a mainframe, or at least temporarily stored in a safe buffer area where data processing personnel can later incorporate the data into a centralized and protected data base.

To fill this security gap not addressed by local-area network vendors and computer companies, a number of vendors of stand-alone security software programs are carving out an active market for their products, especially with departmental users outside the main MIS area.

"The [micro] user community is getting more confident," Rosen of Data Bank Associates explained, "and they are bypassing the data processing facility when it comes to security. For their part, I've found many data processing departments don't realize just what sort of critical spreadsheets and other data are sitting on the personal computers in their corporation.

"Accounting personnel can get tired of hitting their heads against the data processing department, so they have their own budget and do their own shopping. Large data bases are being created on Winchester disk drives, and large disks on personal computers mean that MIS has lost control. I've found micro users to be extraordinarily careless about security. They will not back up files, seldom use hardware security locks and leave passwords in easy view. These users are also buying a lot of the stand-alone security products directly."

Included in the stand-alone products are several kinds of hardware security devices for micros appearing on the market. Timelock, for example, from Timelock Software, Inc., Huntington Station, N.Y., is a business card-size personal security plug-in device. It is configured so that it must be inserted into the IBM Personal Computer's external parallel port, in line with the printer cable, in order to boot up the computer from the hard disk. At the next level of security, the user must correctly enter an identification and password in order to access the computer's hard disk, while all attempts at unauthorized log on and illegal access are recorded.

Timelock has been evaluated at the Federal Home Loan Mortgage Corp. in Washington, D.C. Bill Bings, vice-president, system development, has called the hardware product "good for administrators because it's easy to control user access."

Another device called Secure from Winterhalter, Inc., Ann Arbor, Mich., uses a combination of hardware in the form of a printed circuit board and software on a floppy disk to give two levels of data protection. A master key password enables a security administrator to gain access to all encrypted files and directories.

According to the company, users can create their own identification password and then type in the file or directory name of the data to be protected. The selected files are immediately encrypted. During normal operation of the IBM Personal Computer, the data is automatically converted into its readable (decrypted) form for the authorized user.

Stand-alone devices in total add up to a micro security market (not including the market for local-area network security) of about $66.5 million in 1985, according to Frost & Sullivan, Inc., a New York City research firm. By 1989, the company expects the market to climb to nearly $237 million — steady but not spectacular growth.

"The rush to automate is still going too fast to think about security," Schwartz at Prime Factors said. "Security is still looked at as a negative thing . . . it's the down side of the party."

Kolodziej is a senior writer at Computerworld Focus.

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Company	Package	Features	Random-Access Memory Requirement (in bytes)	Hardware Required	Single Unit Price
Advanced Computer Security Concepts Annandale, Va.	Cryptogard	Plug-in module containing Z-80 processor, Data Encryption Standard software and program protection software. Audit trail facility is optional.	1K	IBM PC, IBM XT	$795
The Answer in Computers San Diego, Calif.	Security	Password protection for installations requiring minimum security measures.	64K, running under MS-DOS 1.1 or higher	IBM PC, IBM XT or compatibles	$50
Fischer-Innis Systems Corp. Naples, Fla.	Watchdog	Restricts and controls access to micro, encrypts files and programs and provides audit trail.	128K, running under MS-DOS 2.0 or higher	IBM PC with hard disk, IBM XT and compatibles with hard disks	$295
International Phasor Telecom, Ltd. Vancouver, Canada	Phasorcode 1000	Data encryption with communications support. Allows for multiple data encryption keys.	256K, running under MS-DOS 2.0 or higher	IBM PC, IBM XT or compatibles; Wang Professional[1]; HP Touchscreen PC[2]	$249; $349 with communications option
Jones Futurex, Inc. Fair Oaks, Calif.	Encryptor 304	Data encryption using proprietary algorithm.	64K with one disk drive, one open expansion slot and PC-DOS 1.0 or higher	IBM PC, IBM XT	$595
Mictel, Inc. Bala Cynwyd, Pa.	PC/Privacy	Data encryption. Provides for the creation of code keys and files to be transported to computers running the same operating system.	Works with CP/M-80, PC-DOS, MS-DOS, Apple-DOS and Macintosh operating systems	IBM PC, IBM XT and compatibles; Apple II, II Plus, IIe and Macintosh[3]	$140, IBM version; $95, Apple-DOS version
Trigram Systems Pittsburg, Pa.	Datasafe	File encryption using Data Encryption Standard algorithm and the use of a single encryption key.	64K, running under MS-DOS 1.3 or higher or PC-DOS 1.1 or higher	IBM PC, IBM XT or compatibles	$139
United Software Security, Inc. McLean, Va.	Privacy Plus	Password and data encryption, with ability to hide files on disk and make them invisible to the disk directory listing.	64K, running under MS-DOS or PC-DOS 1.0 or higher	IBM XT	$159
Westford Systems, Inc. Westford, Mass.	Micro-Track	Monitors use of microcomputers, providing audit trails and optional report generator.	64K, running under PC-DOS 1.0 or higher	IBM XT	$295

[1] Wang Laboratories, Inc.
[2] Hewlett-Packard Co.
[3] Apple Computer, Inc.

Figure 1. Sampling of Micro Security Packages

FOCUS ON NETWORKING

Putting Network Management Into Good Hands

DAVE RIDLEY

·BY·LEE·WHITE·

As local-area networks proliferate, traditional computer categorizations may fall by the wayside. The distinctions between micros, minis and mainframes may weaken as networks assume memory and information-handling proportions approaching those of their larger siblings.

Peripheral sharing is one of the most important reasons organizations look to local-area network solutions. A high-speed laser printer, hard to justify in a single-user environment, becomes cost-effective when shared by many users. However, along with such benefits come attendant problems.

A recent *Computerworld Focus* survey brings these issues to the surface. Data processing managers and consultants repeatedly voiced concern that corporations devote some attention to local-area network management. As networks blur the micro, mini and mainframe lines of demarcation, new levels of computer confusion emerge as a possible scenario.

Vendors and network managers emphasized that a network of 10 personal computers connected to a 40M-byte file server is much more than the sum of its parts. Some surveyed managers said that a local-area network of 10 personal computers is a minicomputer system, while a network of 40 personal computers connected to a 400M-byte file server should be considered a mainframe. And all controls, checks and balances as well as security issues used to govern the mainframe should be applied to this local-area network.

Phil Mateo is a systems engineer with General Electric Co. in Binghamton, N.Y., a facility that makes flight control, engine control and weapon control computers. Most of the employees know computers "inside and out," Mateo said. The network Mateo manages is a Fox Research, Inc. Fox 10-Net with at least 60 personal computers attached to it. At the present time, there is no dial-up capability; only those computers that are hard-wired into the network have access to the files. Mateo made this decision because the security inherent in all local-area network systems is, in his opinion, unsatisfactory.

Another important aspect of network control is the question of access to information. Mateo's decision to limit access to the network was one he had to make in order to get a successful implementation at GE. When sensitive information exists on a file server, access to that information is often assigned on a need-to-know basis. Assigning levels of information access becomes complex, Mateo said.

Now that his network is up and running smoothly, he is about to turn over the day-to-day duties to the business systems staff who will take over the role of network manager. Mateo sees this managerial role as critical, citing a current situation at GE in which other departments are installing a network with little regard to controls. "I have half of my building down right now because something is miswired. Although the wiring is basically simple, you have to have a coordinator to make sure that some electrician doesn't go in there and add 2,000 feet of wiring to your network and bring everybody down. Whenever you have problems, you've got to have somebody troubleshooting," Mateo said.

But beyond the initial installation of the system, overseeing both users' day-to-day activities and the network itself are key to a successful implementation.

Greg Todd is senior systems engineer with Policy Management Systems Corp. (PMSC), in Columbia, S.C., a software development company that works primarily with the insurance community. PMSC has about 300 users on 16 Novell, Inc. networks at its 1,600-employee headquarters building, plus four more networks in satellite offices around the world. These networks, however, are not regarded as separate entities. "We have a very sophisticated internetwork organization, known as 'the network,'" Todd said. Central storage for the network is presently 2.6G bytes of disk storage, averaging about 460M bytes per file server.

The mammoth size of PMSC's network makes it more like a

mainframe than a loose group of personal computers hooked up together. And the controls necessary to run this network should approximate those in place for its bigger brother.

While Todd had no hard and fast rules for all network managers, many of the procedures PMSC is using might have excellent applications in other companies. "We are fortunate because we have many years of mainframe experience. We understand the need for the sort of responsibilities necessary for positions like mine," Todd said. Many calls come in to PMSC from customers who want to get into networking, but a large number of these customers regard a network as merely an extension of a micro. Todd sees this as a fatal mistake and advises organizations to adapt mainframe regimen to the local-area network.

Todd's warnings were echoed by Brad Gordon of Arthur Andersen & Co. in Chicago. Most of Arthur Andersen's 3Com Corp. networks operate as mini mainframes in area offices and require little intervention from headquarters. "When you get into a networking environment, you get back to all the same problems you had with a mainframe. You worry about backup, on- and off-site storage, data integrity, somebody corrupting the system, handling throughput on the printer. When a company heads into networking, there is some front-end planning and there should be somebody who is a network administrator," Gordon said.

Vito Piacenti, a system administrator in the legal department at ITT in New York City, oversees a 54M-byte Nestar Systems, Inc. network with more than 20 users. Piacenti does not work in data processing, but works closely with MIS, viewing himself as a liaison between users and systems professionals.

Although ITT has had the system for almost two years, it is considered to be in the pilot stage because the company is still making changes. Patience is the byword when it comes to local-area networks. "People expect an installation to be an immediate solution. In all honesty, it's the beginning of the solution, not really the solution itself," Piacenti said.

If networks at their highest level begin to blur the lines that now separate micros, minis and mainframes, why would companies opt for personal computer local-area networks over a minicomputer or more disk space on the mainframe?

"We went into the network environment because we thought we could raise the level of competency of the users to manage the system themselves," said Craig Schow, manager of general services at Utah's Brigham Young University. Schow said that in a mini or mainframe environment, the support staff grows as people begin to use the system on an operating basis. The intent was to have a system that would function for the users as an extension of their operation, "not a parallel organization that would have to have support people who were earning more money than [users] were," Schow explained.

At the present time, Brigham Young has three Novell networks servicing six departments in three different buildings, with a maximum of 24 users per file server at any one time. While Schow does not have a data processing background, "I manage two revenue areas at the university, one service area and the data processing for the division as well. I was one of those individuals who was sucked into [being] the guru when the personal computers started in, and I haven't been able to shake it," Schow laughed.

Schow agrees it is extremely important to have a person who can serve as a systems manager, supervisor or administrator, primarily to set up the system and design the configuration of who gets what resources and priorities. Once the system is in place, a non-DP professional can run the daily operations. Eventually, Schow said, networks will become as commonplace as electronic typewriters and copy machines and will require nothing more than a key operator who can monitor use, recognize a problem and know when to call a repairman.

Arguably, a university atmosphere cannot be compared to the average corporate community. For example, members of one academic department rarely need to communicate with members of other departments. In addition, information residing on network file servers or even mainframes is often less sensitive than most corporate information.

Straddling these two organizational structures is the Texas Department of Agriculture in Austin. Fred Zeitler is microcomputer manager and reports to the data processing director. Originally hired as a microcomputer programmer and operations manager, Zeitler rode the wave of micros from the original 8-bit machines. Zeitler was promoted to his present position when a decision was made to purchase personal computers and network hardware and software.

The Texas Department of Agriculture employs approximately 570 people statewide. At Austin headquarters, there are about 250 people, 130 personal computers and seven Fox networks. The biggest network is in the marketing department with 31 personal computers attached. Typically, there are eight to 10 users for each 44M bytes of hard disk storage.

Zeitler insists he does not manage the networks. "Our office aids in the acquisition and installation of the equipment. Then we try to find a network administrator in each division on each network," Zeitler said. This was usually the one person in each department who turned into the micro maven, the person who mastered the software most quickly and seemed to be answering all the questions, he added.

Zeitler had war stories to add to the *Computerworld Focus* survey collection. One department put up a network without an administrator. With no one watching day-to-day operations, frustration mounted. For example, one woman's station had a laser printer attached to it. She had to be on the network constantly because so many people wanted to spool to the laser printer. With no administrator present, many users were incorrectly spooling to one of her disk drives. "She was constantly losing files or getting locked up and finally decided not to boot up on the network," Zeitler said.

More frustration, resistance and reluctance to use the network resulted and people began to bad-mouth the networks themselves. "Something like this will kill you. One of the main points in getting a [local-area network] is to save money on printers," Zeitler said.

Although Zeitler does not agree that a data processing purist should manage the networks, he does think the position is "absolutely essential. If you don't have network administrators, the project is going to fail. You are going to end up with a lot of chaos and confusion, with nobody setting any standards, everybody trying to do his own thing. You're headed for disaster."

> ❞
>
> *'If you don't have network administrators, the project is going to fail. You are going to end up with a lot of chaos and confusion...'*
>
> **— Fred Zeitler**
> **Texas Department of Agriculture**

So what can a company do if its data processing resources are stretched thin, but networks appear to be a good solution to some nagging resource problems? David Smith manages the Corvus Systems, Inc. network at Ducommun Data Systems in Los Angeles. Smith has an undergraduate degree in computer science and has the technical savvy to manage the two file servers, tape backup unit, six utility servers and 45 personal computers attached.

Although Smith said that the technical implementation of a local-area network requires some specific data processing background, he thinks the ideal candidate to manage a network should have some knowledge of computers coupled with an ability to make business decisions and transmit knowledge to the user.

Smith admitted that a person with these qualifications is not easy to find and suggested the use of a consultant to help train the inside person who meets at least some of the criteria. "The consultant could provide adequate education to help that person understand the workings of the system, both from a technical standpoint and from a business standpoint. The system could then grow and change with the needs and for the needs of the people within that business," Smith said.

Whether or not vendors can provide the help necessary to train network managers is a moot point, according to Smith. Although the vendor can provide the neophyte network manager with customers from the vendor's own customer base, it is difficult for the vendor to understand all the business problems that face any given company, Smith said.

Perhaps one of the best pieces of advice is to contact a longtime (usually two years) user. "People ask about our network quite often. And we are more than happy to share information and experience with people who are either getting a network, expanding one or simply doing research in the field of local-area networking," Smith said.

While most network managers surveyed regard local-area networks as a new piece in the technology puzzle, Brigham Young's Schow thinks they will eventually replace minicomputers. "You're going to see the large [vendors] watch the development of networking and when it has a broad enough impact upon the business and manufacturing world, they will begin to phase out their strong promotions of mini-mainframes and go into supporting these new environments. I think IBM has introduced its [token-ring local-area] network as a very small and very limited system. IBM is still selling System/34, 36 and 38, and it's not going to address the network until it thinks it's time to replace those with network environments," Schow said.

Whether local-area networks ever replace minicomputer systems, some of the age-old problems that have gridlocked other computer implementations still exist. Recognizing and addressing these problems up front will assure organizations of a smoother ride. PMSC's Todd said the rift between mainframe and microcomputer aficionados is a grave error on both sides. "It is inevitable that those disciplines merge and become extensions of each other. The problem is the individual fears and animosities and the basic fear of the unknown that is making [networking] a slow and arduous process. [Overcoming] this could be an eloquent way of opening the next chapter in the technology era that we find ourselves in now."

White is a senior writer at Computerworld Focus.

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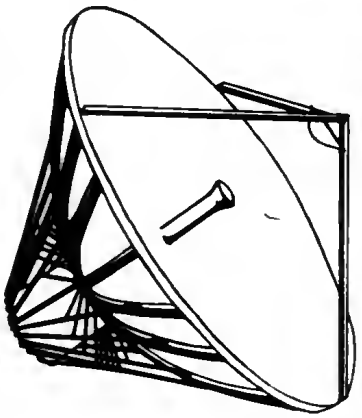

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5	25	45	65	85	105	125	145	165	185	205	225	245	265	285	305	325	345	365	385
6	29	46	66	86	106	126	146	166	186	206	226	246	266	286	306	326	346	366	386
7	27	47	67	87	107	127	147	167	187	207	227	247	267	287	307	327	347	367	387
8	28	48	68	88	106	128	146	168	188	208	228	248	268	288	308	328	348	368	388
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289	309	329	349	369	389
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290	310	330	350	370	390
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291	311	331	351	371	391
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292	312	332	352	372	392
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293	313	333	353	373	393
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294	314	334	354	374	394
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295	315	335	355	375	395
16	35	56	76	96	116	136	156	176	196	216	236	256	276	296	316	336	356	376	396
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297	317	337	357	377	397
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298	318	338	358	378	398
19	39	59	79	99	116	139	159	179	199	216	239	259	279	299	319	339	359	379	399
20	40	80	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400

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Peer-to-Peer Communications

TOM MONAHAN

BY RUDOLF STROBL & EDUARDO STECHER

The notion of IBM's System Network Architecture (SNA) as a hierarchical relationship between terminals and mainframes belongs to the past. The explosive proliferation of computer-based workstations, office systems, computer-aided design, manufacturing and engineering (CAD/CAM/CAE) processors and minicomputers is giving way to the evolution of distributed systems within SNA networks. With Advanced Program-to-Program Communication (APPC), IBM has finally begun to respond to the proliferation of intelligent nodes (IBM PCs, System/36, System/38 and local-area networks that can be considered distributed systems). APPC is an SNA term that encompasses the various protocols and sets of options defined for SNA nodes (a physical unit, PU, with one or more logical units, LU) that supports peer-to-peer information exchange. With APPC, for example, one application in a System/36 may communicate directly with an application in another System/36 or in any other node implementing APPC. But while peer-to-peer communication and distributed networks offer greater networking benefits and better resource allocation to users, they also pose a new challenge to network managers responsible for SNA networks.

In IBM SNA networks, the base of any information exchange is a session. Sessions are logical connections (which may include several physical connections) between two LUs.

Before APPC, at least one of the two LUs within a session had to be in the mainframe. Whenever terminal users wanted to access a business application program, they logged on to the application via the communications program in the mainframe. Virtual Telecommunications Access Method (VTAM), for example, initiates, manages and terminates all sessions between LUs. In other words, LUs are subjected to VTAM logic that resides in the mainframe.

Part of this logic is the System Services Control Point (SSCP), which acts as a focal control point for establishing and terminating sessions, thus giving SNA its centralized flavor. For the purpose of this discussion, we will refer to SSCP simply as the session control manager.

Network management functions are implemented in all SNA nodes with different levels of functionality. For example, all peripheral nodes can collect statistics and relay them to the Network Control Center (NCC). IBM implements the actual functions for the NCC within an application known as the Network Communications Control Facility (NCCF). NCCF receives from VTAM all network management messages. Using NCCF, network managers (by using 3270 terminals) are capable of displaying, tracking and modifying the status of their network.

In order to diagnose any problems on sessions, IBM developed a program product known as the Network Logical Data Manager (NLDM), which resides within NCCF. NLDM provides NCC with the capability to track and diagnose any problems in a session. It's like having a stethoscope into any session (see Figure 1, Page 48).

In addition, SNA networks utilize very intelligent backbone components (3725s or PU Type 4). These backbone components play a key role in statistical and alarm management, perform link diagnostics, relay network status to NCCF and control all dumb peripheral nodes. For example, if users would lose terminals in a subarea network, PU 4 nodes are capable of generating and sending alarms to the session control manager which, in turn, relays them to NCCF. Yet, because every LU has a session into the mainframe (under the supervision of the session control manager) all sessions create a logical star network with the host as the center (see Figure 2, Page 48).

In other words, regardless of the physical network topology, all sessions still end in the host. Only host and host-based program products can detect any exception conditions and take corrective action. With the NLD, therefore, IBM offers NCCF-based network

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managers with the capability to diagnose any session problems.

The introduction of APPC, which provides computers with the ability to establish sessions directly with each other outside the supervision of the session control manager, breaks down the existing control and creates a new set of problems for network managers.

All key vendors addressing their computer products into the IBM marketplace are implementing the ability to look like APPC nodes to IBM computers. For the purposes of this article, the references on APPC functions and network management considerations equally apply to IBM as well as non-IBM vendors.

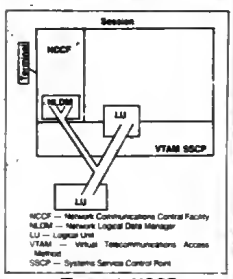


Figure 1. NCCF

APPC is a peer (non-hierarchical) node-to-node connection allowing communication between distributed applications. Currently, six IBM systems can communicate with each other via APPC: MVS, VM/SP, VSE, System/36, System/38 and the IBM local-area network. The first three are mainframes, contain the session control manager and require a 3725 communications processor to communicate. The other three can establish communication with each other only via direct links (leased or switched lines) and without 3725 intervention. Because the session control manager and NCCF reside only on MVS, VM/SP and VSE, sessions can only be monitored by NCC personnel as long as one of the two nodes is a mainframe computer.

Thus, a problem for network managers arises as to how they will gain control over APPC sessions between remote (not mainframe-connected) nodes (System/36, System/38, IBM local-area networks) that have neither a session control manager nor support NCCF, but are perceived by the user as part of the network and, therefore, are subjected to network management services.

Except for VTAM (PU Type 5), most other PUs are relatively dumb when it comes to network management functions.

While all PUs are capable of supporting various degrees of statistical management (for example, counting link traffic) only PU 4 types (37X5/NCP) have relatively strong alarm management functions (8100s and 4700s have some alarm and console management facilities).

The makeup of APPC nodes includes the more intelligent PU 2.1 and LU 6.2, which form the communications platform for APPC. PU 2.1 types support multiple data links and implement their own session manager in support of single or parallel, half-duplex, flip-flop sessions.

As long as sessions between these nodes (for example, between a System/36 and an IBM local-area network) are not subjected to failures, the network can at least operate without NCC intervention or central network management facilities.

Nonetheless, statistical information relative to resource utilization and also to performance still needs to be collected and stored at the NCC.

However, these PU 2.1 types currently don't have all the necessary services required to integrate them into the set of network management services available today in the mainframe.

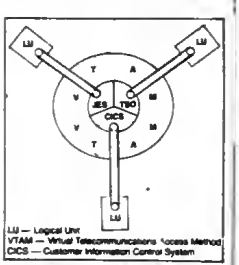
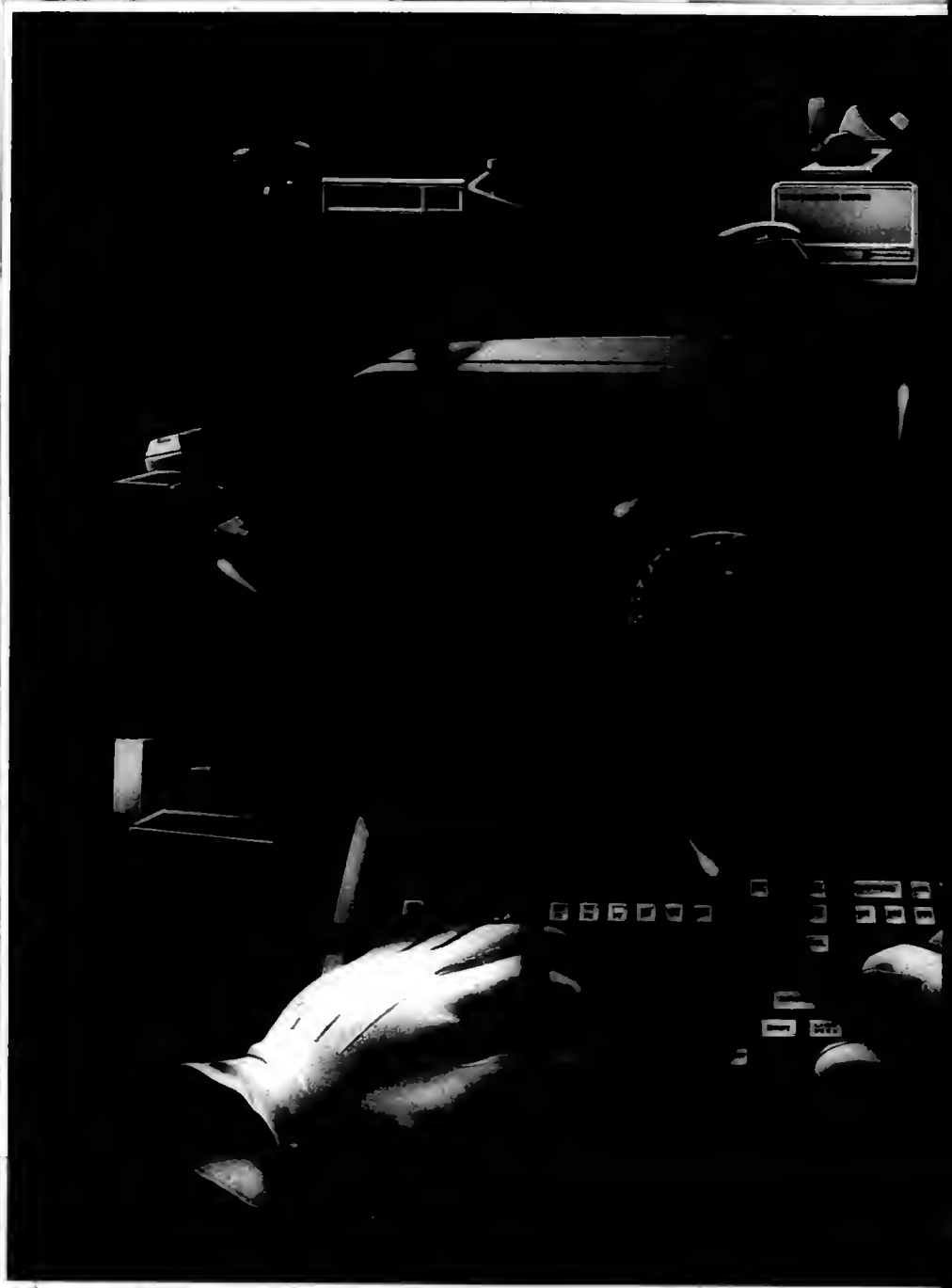


Figure 2. Star Network



Thus, if a link between a System/36 and a local-area network fails and neither of these nodes have an active connection to the mainframe computer, users do not have the problem resolution assistance of NCC personnel. If there are problems, users have no other way of getting help other than calling network management personnel.

However, network managers do not necessarily like to detect network problems via users' phone calls and prefer built-in network alarms to alert them of anomalies, diagnose troubles and resolve them before they result in any type of network disruption. Therefore, exception conditions relative to APPC sessions need to be detected, recorded and made accessible to NCC personnel and programs at all times. Modem diagnostics should be available along with console, statistics and alarm functions, just as they are implemented in backbone network components.

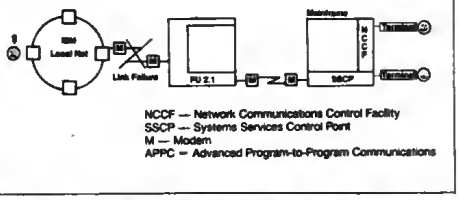


Figure 3. Network Management: APPC Nodes to Mainframes

Today, these network management services are available only to APPC nodes connected to mainframes supporting NCCF (see Figure 3). For example, because PU 2.1 nodes support multiple connections (links), they should be able to collect and report problems of their partner nodes. PU 2.1 nodes still do not have the type of switching functions needed to support sessions between two adjacent nodes. Therefore, there is a requirement that any APPC node supports its partner for relaying statistics, alarms and console functions to neighboring nodes that may have the required mainframe connections to NCCF.

Thus, while users can build fairly productive networks with IBM local-area networks and distributed systems, little or no network management exists today to support them. This may effectively preclude users from growing their distributed networks in cascading environments (for example, nodes at the right and left of System/36 connected to the mainframe in Figure 4, Page 50).

APPC therefore introduces major problems to network managers because NCC facilities and personnel are only visible to directly attached nodes. All problem detection/resolution capabilities are lost for indirectly connected (cascading) nodes. Growth of these distributed networks may be severely impacted until the facilities necessary to resolve network management problems are available.

With the advent of APPC, these nodes need to become much smarter in terms of network management. PU 2.1 nodes need to implement some of the PU 4 and some new network functions with the capability to:

- Perform self or remotely initiated link and modem diagnostic functions.
- Collect and store or send statistics to the NCC.
- Detect and store or send exception conditions to the NCC.
- Allow remote changes to configuration parameters.
- Relay network management information to a mainframe NCCF (if the link between the APPC node and the mainframe is active) or, if it is not active, store the information locally and provide it when NCCF calls in for it.
- Respond to actions initiated by NCCFs to collect or disregard communication events (for example, an IBM local-area network will have the same information as its peer System/36 and the mainframe NCCF should be able to capture it from

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either node or assign to one node the monitoring/collection/reporting responsibilities.

• Serve as a relay between other nodes and connected NCCFs (a PU 2.1 should have store and forward capabilities so that network management information can flow from a peer cascading node into the NCC).

Network managers must be able to configure which PU 2.1 should record and maintain network management information. Moreover, they need to be capable of dynamically altering network management parameters on nodes (such as initiate diagnostics, set alarms, request delivery of stored network management information). Finally, network managers need these capabilities for all nodes directly or indirectly connected to a mainframe.

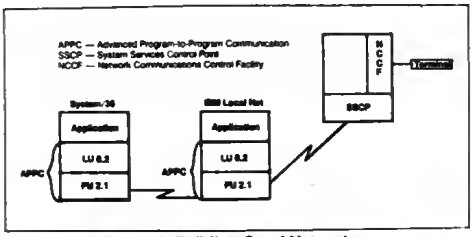

Figure 4. Building Good Networks

Thus, a PU 2.1 has to have functions similar to those of a PU 4. You could therefore say that PU 2.1 is equal to PU 4 plus PU 2. But a PU 2.1 is even more complex and therefore requires more functionality than a physical unit. PU 4 types have no store and forward capability because they are always on-line with some mainframe. In contrast, PU 2.1 nodes may not always be connected to mainframes; thus, the need for store and forward network management functions.

At this date, PU 2.1 network management functionality has not been announced by IBM. And while IBM indicated a close tie-in of its recently announced token-ring local-area network with NCCF and Network Problem Determination Application (NPDA), no new functions have yet been released for this product.

But then, the real question remains of how users will manage a network consisting purely of departmental machines (System/38s that attach local-area networks, System/36s, personal computers and so on) and without a mainframe.

To date, in such a network, IBM provides incomplete network management services. Thus, there is a strong need to bring NCCF-like functions to System/36 or System/38 departmental processors. There is little likelihood that this will happen for some time.

Therefore, users who are planning distributed networks should be cognisent of the network management implications. The success of the concept of departmental machines and local-area networks is based on the acceptance of these systems by end users and the ablity to provide them with functions that will help them reduce costs and raise productivity. These end users are the non-data processing-oriented individuals who require, more than anybody else, good network services, reliable components and strong support.

As IBM successfully breaks away from the central data processing shop and sells computers to end users, the inability to give them timely on-line network support in APPC networks could jeopardize its business success. ◼

Strobl is a senior consultant at Software Research Corp., Natick, Mass., and is involved in the planning and project management of information delivery products.

Stecher is vice-president of marketing and strategic planning at Software Research Corp., a Natick, Mass.-based network services and consulting firm.

Ryder Takes Communications on the Road

BY LEE WHITE

Computer communications has become one of the most important keys to corporate growth. But as important as communications might be to most businesses, it is even more critical to the transportation industry.

Although Ryder System, Inc., headquartered in Miami, saw revenue of $2.5 billion in 1984, a 22% increase over 1983 and the eighth of nine years of record earnings, management is not sitting idly by counting its blessings. Most of their profits are derived from their transportation divisions; and the competition in the transportation industry, partially due to deregulation, is mighty stiff. Their mission is to find the competitive edge, and communications is one way they see to achieve that goal.

By far the largest division in Ryder is Ryder Truck Rental, Inc., (RTR) with headquarters in Miami and 120 district offices plus 500 branch offices nationwide. RTR rents or leases approximately 75,000 trucks, and its customers can add options that may include drivers, fuel, insurance and vehicle maintenance. Many of Ryder's customers lease entire fleets of trucks, replacing the familiar Ryder yellow paint with their own colors and logos.

While some of RTR's customers opt for only the basic truck rental, the majority also choose to have RTR run a good part of the operation. And RTR's overwhelming concern is the same as the rest of the corporation: providing superb customer service in as highly competitive an industry as exists today. What that really boils down to, according to Scott Ambler, RTR director of management information systems technology, is "how you structure your computer and communications facilities in a way that supports a customer-oriented decentralized management style — a style that provides information for the corporation at a central level without imposing undue paperwork on the business."

Although Ambler's definition would pertain to any kind of business, Ryder's communications strategy is particularly applicable to a company whose main business is to keep moving. At Miami headquarters there is a large IBM mainframe complex that supports the field organization. Each of the 120 district offices is its own profit center, and each is managed in a way that provides incentives to management at that field level for its own bottom-line profit performance. "The district managers have a lot of autonomy," Ambler explained. "They really run their own $10- to $20-million dollar businesses themselves."

At present, branch-to-district communications are taking place on leased lines in an asynchronous mode with multiplexers at each end, primarily using personal computers and IBM Displaywriters. The asynchronous speed of transmission is 300 to 1,200 bit/sec. Each night when 85% of the transmission takes place, district offices utilize bisynchronous transmission at 2,400 to 4,800 bit/sec to send headquarters its daily tallies. Headquarters then generates the daily profit-and-loss statement that is in the district offices the next morning.

While RTR is very efficiently running its business with the communications protocols, hardware and technology available today, Jack Gay, manager of telecommunications for RTR, sees even more exciting developments not too far down the road. RTR is looking at many different ways of telecommunicating, including the interfacing of different kinds of electronics to pull information from truck-based on-board computers (see sidebar). Gay has recently had discussions with a small engineering company that wants to put modulation devices

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on the headlights of the trucks and a receptor at the fuel island. A blink of the headlights would automatically transfer the information from the on-board computer to the receiving device on the fuel island.

In 1986, Gay said, the capability will exist to send locator information from the vehicle to the base station. By 1987, he expects to see two-way communication. And by 1988 or 1989, Gay believes that cost-effective communications via satellite with over-the-road vehicles will be a reality.

"With the Geostar system [Geostar Corp., Princeton, N.J., developers of a satellite system known as radiodetermination satellite services], we could know when a tractor crossed a state line by latitude and longitude, what the route was, when he crossed the next state boundary and how many miles the driver ran in the state.

"Putting that information back here with other information necessary for tax reporting would take all of the administrative processing in our district offices totally out of the picture," Gay added.

Although RTR in Miami has the largest communications facility of all the divisions, perhaps the communications heart of Ryder is its Financial and Communication Services Division (FCS) in Nashville. Formed in 1984 following the sale of Truckstops of America, FCS provides premium billing, cash transfer, fuel tax reporting and data services to the highway transportation industry and provides cash transfer services to credit unions and other markets.

Subscribers to FCS can either be renters or lessees of RTR or have no relationship to that part of the corporation. But each time a driver pulls his truck into a truck stop or fuel island, details of purchases are transmitted either by phone or computer to an operations area at FCS. Central, as it is known at FCS, operates 24 hours a day, seven days a week, 365 days a year, providing information and verification to drivers and fuel station personnel alike.

At this point, most of the verification calls coming into Central are voice calls; on a given weekday, the 48 operators can handle each of the 18,000 voice or electronic calls in approximately 65 seconds. According to Donald Green, vice-president of MIS at FCS, there are presently 600 point-of-sale General Telephone and Electronics Microfone II computers at truck stops across the country. FCS hopes to expand that number to 1,000 within the next six months because the company saves about 35 cents a call using electronic calls rather than voice calls.

Central will soon convert the present AT&T Horizon automatic call director (ACD) to a Rockwell Galaxy ACD because AT&T does not make an ACD larger than the 48-station unit. Although the company could add another Horizon system, the two could not operate as a single unit; thus the decision was made to go with another vendor.

When the GTE point-of-sale unit is used, the amount of information that can be input in a short amount of time by the cashier at the truck stop is staggering. In many cases, truck drivers are given particular boundaries for each of their trips. The drivers are given routes that are assigned not only for the shortest distance between points but also to make the assigned quota for various states' highway use taxes.

> *"In 1986, Ryder said the capability to send information from the vehicle to the base station will exist. By 1987, Ryder expects to see two-way communication. And by 1988 or 1989, Ryder believes that cost-effective communications via satellite with over-the-road vehicles will be a reality.*

When trucks travel through states, a predetermined minimum highway tax is assessed. If highway taxes show a debit for Ohio and a credit for Kentucky, a truck will be rerouted for fuel to Kentucky instead of Ohio.

In addition to the assigned routes, drivers are allotted just enough fuel, oil and anticipated maintenance money required to complete the trip. They may be required to fill their fuel tanks with one of four or five different kinds of fuel and only at self-service pumps. They may be allowed to purchase oil on a pour-only basis instead of buying a case or two at a time. In some cases, the fleet operator may want the driver to get a cashier's check instead of charging the purchase

in order to take advantage of discounts available for cash transactions. In addition, notation is made of the truck's mileage and license plate number. In all, the variables number well over 25.

The cashier inputs all of this information in response to prompts on the ribbon readout on the Microfone. Once the information is keyed in, it is sent on a real-time basis via the General Electric Information Services Co. network directly to Nashville, which has its own node on the network because of the sheer volume involved. At that point an operator verifies the information and either gives an OK or denies the sale.

Another service FCS makes available to its customers for a nominal fee is a piece of software that takes all the information gleaned from either voice or electronic data and creates reports.

But the point-of-sale electronic and voice network is only one piece of FCS' pie. George Stoeckert, president of FCS, said there are even people at Ryder headquarters who don't understand the extent of the business transacted at FCS.

Another service FCS makes available to its customers for a nominal fee is a piece of software that takes all the information gleaned from either voice or electronic data and creates reports. The program, written by Jack Pratt, manager of GE systems, will run on either an IBM Personal Computer or Apple Computer, Inc. Apple IIC.

This provides the customer with an automatic logon and a choice of all the variables for any specified period of time. These are then combined into any one of a wide range of different reports.

Once the customer chooses the report format, the variables, report or both can be downloaded to a printer and/or diskette. At this point the program automatically logs off. In addition, the material can be compressed in such a way that 26 diskettes will hold an entire year's information for most companies.

Another interesting part of FCS' business is Cashchek, automated teller machines located in Atlantic City and Las Vegas, Nev., that provide instant cash via Mastercard or Visa. While Ryder has no great affinity for the gaming business, several of its competitors (among them Comdata Network, Inc., Western Union Co. and Fundsnet, Inc.) are already in that business.

What has happened, Stoeckert explained, is competition in the transportation industry has become so tough that prices have dropped 50% in the last two and one-half years. Many of FCS' competitors have supported the aggressive price cutting with profits from the cash machines in the casinos.

Stoeckert hopes FCS' entry into the gaming business will "kick the legs out from underneath [our competition] in the area in which they were drawing all the profits to support the price reductions in the transportation industry."

While Stoeckert does not know just how much money is at stake in the casino cash transaction business, he does know that in a two-week period of time Cashchek penetrated 60% of the market in Atlantic City. "That's why [our competitors] are going to go berserk when they see

CORPORATE ACCOMPLISHMENTS

what we've done. It's big dollars. I would guess it's probably about $9 million a year in profit to Comdata Network," Stoeckert said.

If Stoeckert says there's money to be made, chances are FCS will make it. Presently, FCS has the second largest gross operating cash flow of any company in Ryder.

During the month of October 1985, FCS moved, transferred or billed $70 million. They processed 20,000 check payments. And all this was accomplished with only 350 people. Although the competitive nature of the trucking business may make it difficult to standardize procedural activities in systems and communications and operations, Stoeckert said FCS' objective is to do just that while staying within the perimeters of service providers to their customer base.

Another Ryder division offering its customers innovative communications solutions is Interstate Contract Carrier Corp./Western Express (ICCC) in Salt Lake City. ICCC, which has a 48-state operating authority and is one of the nation's largest irregular-route common carriers, has the same charter as the other divisions: high-quality, economically effective distribution and transportation services.

One of these services is the Driver Call-In Program. Drivers are required to phone in and report their status three times each day. After each call, the customer data base is updated in Salt Lake City. At present, the driver gives information to an operator. By early 1986, the driver will interface with digitized responses.

Customers of ICCC using any standard personal computer can call into the data base and trace their freight via their bill-of-lading number or specific trailer number, according to Jim Snow, ICCC's vice-president of MIS.

The difference between the methods used by ICCC and those employed by FCS in Nashville pertain primarily to vehicle ownership. "Here at ICCC we run basically with owner/operators. This person leases his tractor to us on a contract for a period of one year. The driver will pick up our trailer equipment, load it with the customer's goods and take it down the road to deliver it at a predetermined place and time," Snow explained.

The beauty of a system like this one, called Electronic Data Interchange, is it enables both the driver and the customer to make changes and to communicate with each other at any time, day or night. The customer can give the company to which the load is being shipped accurate and timely information, and the driver can be kept informed about last-minute changes. The system also helps to eliminate trucks running without loads and downtime due to equipment failure and provides immediate notification for unforeseen delays.

While each of the three Ryder transportation divisions operates in an independent manner with obvious success, there is a department at Ryder in Miami that makes sure everything holds together — corporate systems. Under this umbrella David Caswell, vice-president; Kelsey Hill, director of corporate communications and systems support; and Sheila Solen, director of MIS and systems support, see to it that no one in any of the divisions loses sight of the big picture.

> *What Ryder hopes to do is to use a communications network that will allow the divisions and the customers to interconnect for both voice and data. This will give Ryder the competitive edge it needs to remain at the top of its market.*

"We want to take advantage of the entrepreneurial aspects of [the divisions'] autonomy, but we also want to capitalize on the sharing that can occur, the benefits that Ryder has to offer as a big group to each of the individual companies and then offer the complete integrated product line to our customers," Solen said. Hill echoed Solen's sentiments adding, "It's easy for [the divisions] to focus on their individual goals and not think about the synergy that's needed in a multidivisional corporation."

What Ryder hopes to do is to use a communications network that will allow the divisions and the customers to interconnect for both voice and data. This, Hill said, will give Ryder the competitive edge it needs to remain at the top of its market.

White is a senior writer at Computerworld Focus.

CORPORATE ACCOMPLISHMENTS

On-Board Computers Speed Productivity

Because Ryder Truck Rental, Inc. (RTR) with its 75,000 trucks is the primary business of Ryder System, Inc., the ultimate communications device would connect the operation of the trucks themselves to where the information could be collated.

For some time now, Ryder has been in the experimental phase with on-board computers and has about 3,000 units in operation now. While on-board computer can replace much of the manual logging by drivers, the main reason Ryder is trying to use on-board computers in their trucks is to increase productivity of the trucks themselves. The bottom line for truck productivity is the faster the truck goes, the more fuel is consumed, said Dennis Honan, project manager for purchasing and maintenance in the systems development and support group for RTR. "When you have an over-the-road tractor that goes 100,000 miles per year and gets five miles a gallon, you're spending between $25,000 and $30,000 on fuel per truck. If you can improve that by 20%, you've got a big savings per truck," Honan explained. And the savings have to be big. Each on-board computer costs about $1,200 per vehicle, in addition to about $3,000 for the data link per location plus personal computer hardware and software.

The on-board computer works using sensors. One sensor detects how fast the truck is going, another detects engine speed. If the truck is idling, this is read separately.

The unit used in Ryder trucks is made by Rockwell International. Attached to the computer is a device called a datalink, which pulls the information onto a cassette from the computer's memory. This cassette is plugged into a personal computer so special reports can be generated.

While on-board computers are currently being used to increase driver and vehicle productivity, Ryder representatives see new adjunct uses. One by-product of information gleaned from the computers would be the ability to predict necessary preventive maintenance. If it is found that engine problems develop at 80,000 miles, trucks could be brought in at 75,000 miles to prevent on-the-road breakdowns.

Another possibility with new generations of on-board computers will involve real-time driver interfaces. Drivers could be told what route should be taken. The driver in turn can enter information such as what shipment was dropped off, what was picked up and if any damage to the load was sustained. But to really make the systems pay off, Honan said, the information should then be integrated with payroll, expense accounting and distribution systems.

Hurdles of cost-effectiveness and technological sophistication will no doubt be overcome soon. But the biggest roadblock seems to be resistance to the new technology.

The drivers, Honan said, generally don't like the on-board computers. "Nobody likes to be monitored. One of the reasons they become drivers is because they like to be out on the road, with nobody standing over their shoulders," he said. To counter the negative response, Ryder works closely with customers to explain advantages and disadvantages of the computers. Ryder representatives teach customers how to approach the drivers, how to implement effective reward systems and how to establish appropriate objectives for their on-board computer programs.

Results are predictable if effective education is not made part of the program. "You should see what happens to some of these machines. The driver will bring back a flattened computer. It's obviously been run over, but the driver will insist he dropped it," Jack Gay, manager of telecommunications for RTR, said.

— Lee White

PRODUCTS

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LU 6.2 Meets SNA

·BY·JOHN·DOHERTY·

Two recent announcements by IBM have clearly demonstrated the company's continued commitment to drive its distributed processing systems forward. One is the long anticipated announcement of IBM's Token-Ring local-area network. Although an incomplete package when announced last October, the immediate public reaction by major local-area vendors including 3Com Corp.; Proteon, Inc.; Ungermann-Bass, Inc.; Bridge Communications, Inc.; Nestar Systems, Inc.; Novell, Inc.; and others indicated the viability of token-ring as a network standard for a long time to come. Token-Ring, a twisted-pair wire token passing network, along with IBM's broadband PC Net and token-bus broadband Industrial Network, is a milestone in the company's publicized strategy to interconnect microcomputers, minicomputers and mainframe systems under its System Network Architecture (SNA).

The second announcement was IBM's APPC/PC software package that implements an LU (Logical Unit) 6.2 program-to-program communications interface for micros on the network. LU 6.2, also referred to as Advanced Program-to-Program Communications (APPC), had been running on System/36 and System/38 minicomputers and other devices, but not on microcomputers. In order to access the peer-to-peer facilities of LU 6.2 resident on the mainframe, personal computer users had to connect through a System/36 under CICS, a terminal communications software component of Distributed Office Support System (Disoss). APPC/PC, however, is IBM's first release of LU 6.2 for microcomputers for direct links to other systems. With LU 6.2 implementation, personal computers can communicate directly and interactively with minisystems including the 8100, System/36, System/38 and Series/1 and to the company's large 4300, 3080 and 370 mainframes. To many observers, both the Token-Ring and APPC/PC products are further steps in IBM's plans for mastering universal intermachine connectivity for its products with network control and command procedures built around the micro.

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Beyond this, however, LU 6.2 is being supported by other computer manufacturers including Digital Equipment Corp. and Apple Computer, Inc. as quick migration routes into IBM's SNA world. Further developed by third-party software houses, LU 6.2 will eventually be built into many computer products, including non-IBM equipment, and will provide communications between the distributed resources of networks. LU 6.2, therefore, has the capability to become the key for a universal network operating system.

Developed in 1982, LU 6.2 essentially incorporates and supersedes existing SNA LU types under a strict input/output hierarchy centered around a mainframe. Earlier LUs defined two-way interactions between the mainframe and a specific 3270 hardware device or node. For instance, LU 1 is used for host program-to-device communications using EBCDIC mainframe codes such as printers. LU 2 is used for communications between a host and a display terminal using 3270 communications, LU 3 for host-to-printer communications using 3270 communications and LU 4 for host-to-device communications between two peripheral nodes. LU 4 may implement both

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data and word processing controls.

Connectivity on SNA is achieved through a message-transport service between the host and an assigned LU device. An end user wishing to access host files from a display-only or dumb terminal, for example, would activate a conversation with the host by automatically identifying his device type. The host would then send the data requested via SNA transport messenger and format it according to the terminal's screen presentation specifications.

While SNA communications worked well under IBM's concept of mainframe-to-device resource sharing, it couldn't anticipate the microcomputer as a co-processor on the host's network. Before LU 6.2, there was no generic LU type for conversations between distributed processors on the network. Therefore, microcomputers had to disguise themselves as dumb terminals in order to access host data. This not only invalidated the micro's powerful processing capabilities on the network, but had the tendency to regulate personal computers in the workplace to stand-alone workstations. Micro-to-mainframe links can ameliorate host-to-micro communications, but full network control is still maintained by the host.

Ideally, communications between all network devices, including but not dependent on the host, in a peer-to-peer relationship would facilitate and build upon the available computing capabilities for all processors on the network. The system would be multitasking, allowing micro users to retrieve, process, upload and transfer data and set print spooling requirements in a single session. This is the strategic importance of LU 6.2.

LU 6.2 is a single LU type for all IBM and, in the future, non-IBM products that support distributed processing. The LU 6.2 protocol boundary contains a set of verbs and parameters that provides common syntax and semantics for the way transaction programs interact with SNA. This gives users a standard, uniform language for designing and implementing communications for network systems.

Each layer of SNA defines and controls a certain set of protocols that build upon the previous ones to form an integrated system for managing data communications on the network. At its position in the sixth presentation services layer, LU 6.2 builds upon the LU-binding features of the sessions layers that facilitate communications between LUs by performing the following functions:

• ***Synchronous or concurrent program-to-program communications:*** The program-to-program feature of LU 6.2 permits end users to send and receive data and execute programs anywhere in the network. Conversations are possible between two machines with different operating systems.

• ***Parallel sessions between pairs of programs simultaneously:*** Parallel sessions facilitate several conversations between programs simultaneously. A user can therefore implement a single LU that can engage in multiple simultaneous sessions with another LU, or single sessions with several different LUs. This capability supports multitasking operations across pairs of processors and is a critical element of LU 6.2 for network operations.

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• ***Application-to-application communications:*** Application-to-application communications create a symmetry between devices on the network so that each node assumes a responsibility for data recovery. It also allows application programs to interact regardless of the program language.

• ***Peer-to-peer communications between all networked nodes:*** Peer-to-peer communications exist between two connected nodes without the need for a central control point, such as a host, as incorporated under Virtual Telecommunications Access Method (VTAM). This allows all intelligent devices on the network to converse in pairs as equals, which breaks the strict hierarchical host functions under traditional 3270 communications.

• ***Packet technology for data transfer:*** Under LU 6.2, data is sent in compressed packets instead of pages of information as currently designed in a typical 3270 implementation.

• ***Program Security:*** Under 3270 emulation, host data is transient and users can locally record information on micros. The LU 6.2 protocol, however, implements conversations between application programs at the micro and receiver node, thus permitting network managers to install security systems at the program level. In this regard, micro sessions under LU 6.2 are safer than 3270 emulation.

It is these features of LU 6.2 that make it a universal interface for distributed applications processing and intermachine communications. This is the reason it has attracted so much attention lately. For MIS data processing and telecommunications managers, LU 6.2 implementations hold the promise of tying together otherwise noncompatible machines into a unified network that makes the best use of a company's considerable communications investment. For end users, LU 6.2 will make possible a distributed processing system centered around the desktop micro that will let them access and process documents more quickly and efficiently.

IBM has clearly demonstrated the role LU 6.2 will play in SNA. Beyond that, there is a strong potential for applying the connectivity features of LU 6.2 to non-SNA networks. This will be clearly demonstrated in office automation strategies, where users are now restricted to exchanging data streams with a particular system using only the programs that can be constructed within that system's parameters. Connecting local systems together to build multiple systems will allow users to access, process and transfer data across different local networks for interactively processing and interchanging information. This will expand the concept of local networks. Users can take advantage, therefore, of inexpensive ASCII-type terminals and mainframe storage capabilities while enhancing local processing options.

With internetwork communications, data access will not only be universal, but, more importantly, will be transparent to the user. The specialized features of one system could be utilized in a variety of areas that were not available before, giving MIS managers greater flexibility for defining data processing operations. For instance, under LU 6.2 data can be located automatically anywhere on the network, without the user having to know the specific location. Users could therefore edit sections of a document on one system and transmit it without routing it through a host to another system for specialized printing. Or spreadsheets from one system could be incorporated into a corporate financial report located on another system.

As other computer manufacturers adopt LU 6.2, links will be established between SNA and, for instance, mid-range systems including DEC's VAX, Data General Corp.'s Eclipse MV/Series and Wang Laboratories, Inc.'s VS. Network managers will then be able to interconnect different systems to create expanded network topologies including terminal and PC clusters and local-area networks. In this way, micro users can access data from the local host or from the central mainframe via the local host. This permits managers to construct modular networks for different applications using a variety of IBM and non-IBM equipment.

At the heart of internetwork communications is the need for a standard convention for exchanging and formatting data that is uniform across machines and systems now using different architectures. The computer and communications industry is working toward establishing guidelines for this purpose, and most vendors are committed to meeting standard specifications formulated under the auspices of groups such as the International Organization for Standardization and the National Bureau of Standards.

Another example of cooperation among the industry is the growing and continued support by over 175 vendors for General Motors Corp.'s Manufacturing Automation Protocol, which, so far, has demonstrated intermachine compatibility over a token passing network as part of GM's factory of the future model. As the need to find a clear communications standard for hardware and software at the systems and applications level grows, LU 6.2 will probably play a major part in the final solution for universal connectivity and distributed applications processing.

Doherty is vice-president of marketing and sales at Rabbit Software Corp., a manufacturer of business software communication products for micro-to-mainframe links, local-area networks and software protocols in Malvern, Pa.

PRODUCTS

CXI Introduces Gateway

PALO ALTO, Calif. — Users of IBM Personal Computers linked to an IBM PC Network or other Netbios-compatible local-area network can now access mainframe-based information using 3270 Pcox/Gateway coaxial and remote micro-to-mainframe connections from CXI, Inc.

The new gateway products include the Pcox/Gateway coax connection and the Pcox/Gateway-16 and Pcox/Gateway-64 remote connections, which emulate IBM 3274 cluster controllers.

CXI said the Pcox/Gateway coax connection provides access to five mainframe sessions within a local-area network and allows users to share inherent network resources in existing 3274 cluster controllers, avoiding the expense of adding modems and support programs. The Pcox/Gateway coax connection supports the IBM Systems Network Architecture (SNA) and non-SNA communications, including bisynchronous protocol.

CXI's New Gateway Products

The company said its Pcox/Gateway-16 remote connection provides local-area network workstations with remote access to 16 concurrent host sessions. The connection emulates a remote SNA/ Synchronous Data Link Control (SDLC) or bisynchronous 3274 cluster controller. Linking with a synchronous modem to an IBM 3705, IBM 3725 or equivalent communications controller, the company said transmission speeds of 19.2K bit/sec are attained.

CXI added that its Pcox/Gateway-64 connection includes an Intel Corp. 80188 microprocessor and provides up to 64 concurrent host sessions.

The Pcox/Gateway coax is priced at $2,995, the Pcox/Gateway-16 at $2,595 and the Pcox/Gateway-64 at $4,595. For further information, contact CXI, Inc., 3606 W. Bayshore Road, Palo Alto, Calif. 94303.

Circle Reader Service Number 201

Four Netbios Products Announced

IRVINE, Calif. — AST Research, Inc. recently announced four products for the IBM Netbios local-area network marketplace: AST-Resource Sharing Network; AST SNA/BSC Gateway; AST Network Program; and Knight Data Security Manager.

The AST-Resource Sharing Network is capable of linking up to 64 IBM Personal Computers, PC XTs and PC ATs with a data transmission speed of 5M bit/sec. Consisting of a single-slot adapter card and software package, the new baseband, CSMA/CD-based network offers features including RG-59 coaxial cable to link nodes, an intelligent controller that offloads the host PC, support for up to 1500 feet of cable without signal repeaters, translators or access units and lower power requirement, eliminating concern over the computer's power supply capabilities, said the vendor.

As a complement to the Resource Sharing Network, AST also announced its AST SNA/BSC Gateway, a hardware and software package that allows up to 32 IBM PCs, PC XTs, PC ATs or PC-compatible computers linked together in an AST, IBM or IBM-compatible local area network to communicate with a host IBM mainframe computer. This will transform the personal computer into a gateway emulating an IBM 3274 or 3276 cluster control unit.

Finally, AST announced two software programs. The AST Network Program is a user interface which facilitates the sharing of data files, printers and hard disk storage devices. AST's Knight Data Security Manager provides AST-Resource Sharing Network users with a data security management system.

AST-Resource Sharing Network is priced at $495 per node with kits consisting of two network adapter cards, cable and the complete software needed to link two personal computers also available. Suggested prices for the AST SNA/BSC Gateway, AST Network Program and Knight Data Security Manager begin at $1,795, $75 per node and $395 per network respectively. For more information, contact AST Research, Inc., 2121 Alton Ave., Irvine, Calif. 92714.

Circle Reader Service Number 202

Local-Area Network Introduced

ROCHESTER, N.Y. — Xerox Corp. has introduced Xerox Communications 24, a 10M-bit/sec local-area network that can connect up to 30 Xerox 6060 family workstations or other MS-DOS Version 3.1-based personal computers over a 600-foot cable segment. As many as 900 devices can be added with additional cabling and repeaters.

XC 24 offers several options for sharing hard disks, files and printers among networked workstations. Up to three printers can be attached to a single hard-disk workstation. Laser printers, daisy-wheel printers and dot matrix printers can be configured on the same network, and users can print documents on a shared printer without affecting the shared printer workstation, according to the company. In addition, any hard-disk workstation can be configured as a server, eliminating the need for a dedicated network server, the company said.

XC 24 utilizes a bus topology rather than the star or token-ring networks; as a result, XC 24 does not depend on any single workstation for the network to remain operable. However, the company said that the product is compatible with IBM token-ring network and PC network applications software.

Per node pricing including hardware and software will be between $600 and $850. Contact Xerox Corp., Xerox Square 006, Rochester, N.Y. 14644.

Circle Reader Service Number 203

Corvus Systems, Inc.'s Omninet Network Interface for Macintosh

Corvus Offers Network Interface

SAN JOSE, Calif. — Corvus Systems, Inc. has announced its Macintosh Omninet Network Interface, a local-area network connection that, according to the company, enables Apple Computer, Inc. Macintosh computers (with at least 512K of main memory) to connect to a Corvus Omninet network.

Corvus said its interface, when used with its disk management network software, allows Macintosh users to share Corvus Omnidrive disk drives. The company added that files with common data structures (such as Lotus Development Corp.'s 1-2-3 and Jazz spreadsheet files) can be transmitted between IBM Personal Computers and compatible Macintosh computers.

Macintosh data volumes on the Omnidrive can be archived using the Bank, a Corvus removable tape cartridge backup device through an IBM PC or Apple Computer, Inc. IIe computer.

The company added that its Omninet Network Interface attaches to the Macintosh modem port through a ribbon cable. The network interface is priced at $395 per station, and the disk management network software is priced at $395 per network. For further information, contact Corvus Systems, Inc., 2100 Corvus Drive, San Jose, Calif. 95124.

Circle Reader Service Number 204

Harris Offers PBX

NOVATO, Calif. — The Digital Telephone Systems Division of Harris Corp. has introduced its Harris 20-20 private branch exchange (PBX).

The attendant console, called the Harris 20-20 Attendant Workstation, offers a messaging capability that enables PBX attendants to store phone messages electronically and transmit them to station sets. The workstation also gives telephone attendants a complete overview of incoming and outgoing calls by displaying call status information on a full-size computer screen. The console also speeds call transfer by looking up the name and extension of a called party on a computerized directory. An update facility to the directory stores up to 12,000 names.

The Attendant Workstation groups each call on the screen under the appropriate category — as an active call, the next call in line or as a recall. Calls that go unanswered or are held by the attendant reappear on the screen in the "recall" area. Up to eight such calls can be displayed at once, permitting the attendant to choose which one to handle next.

The Harris 20-20 Attendant Workstation uses a 16-bit microprocessor and a single twisted-pair wire to provide a 64K-bit/sec voice and 16K-bit/sec signaling channel that link to the digital line unit. For uninterrupted service in the event of a power outage, the critical electronics in the workstation are powered from the PBX with an additional pair of wires.

The Harris 20-20 PBX with Attendant Workstation costs between $400 and $800 per line.

For further information, contact Harris Corp., Digital Telephone Systems Division, Novato, Calif. 94948.

Circle Reader Service Number 205

Harris 20-20 Attendant Workstation

File Transfer Debuts

NATICK, Mass. — ftPATH, a two-way binary and text file transfer product, has been introduced by Pathway Design, Inc. The company said ftPATH is for IBM Personal Computers and compatibles equipped with Pathway Design's pcPATH Systems Network Architecture 3270 and bisynchronous 3270 communications software.

The company said that with ftPATH, an IBM PC running IBM's Professional Office System (Profs)/PCC software can exchange electronic mail and document files with an IBM host using Profs, and can also receive optional program messages, file transfer statistics and 3270 system messages.

ftPATH is priced at $115. For further information, contact Pathway Design, Inc., P.O. Box 8179, 1 Apple Hill, Natick, Mass. 01760.

Circle Reader Service Number 206

PRODUCTS

Ungermann-Bass, Inc. Buffered Repeater

High-Speed Network Repeater Unit Introduced

SANTA CLARA, Calif. — A high-speed protocol- and media-independent network repeater unit was introduced by Ungermann-Bass, Inc. The Buffered Repeater allows users of Ethernet-compatible local net systems running Digital Equipment Corp. Decnet, Transmission Control Protocol/Internet Protocol (TCP/IP), International Standard Organization or Xerox Corp. Network Systems communications protocols to extend the geographic coverage of their networks beyond the 2800-meter limitations specified for Ethernet, the company said.

The Buffered Repeater allows users to interconnect individual baseband, thin coaxial cable, optical fiber and broadband systems in private premise environments. Users can link a baseband system in one location to other similar Ethernet systems as far away as 10 miles. Up to 16 multisegmented networks can be interconnected to support end-to-end communications over 27 miles of baseband cable, the company said.

The Buffered Repeater is available in two versions: the baseband-to-baseband is $3,000 and the baseband-to-broadband including internal modem is $3,800. Contact Ungermann-Bass, Inc., 2560 Mission College Blvd., Santa Clara, Calif. 95052.

Circle Reader Service Number 207

Link Debuts

MERRIMACK, N.H. — LAN Bridge 100, a device that enables users to link multiple Ethernet local-area networks together, was announced by Digital Equipment Corp. According to the company, an extended network using multiple LAN Bridge 100s can support thousands of computers on baseband, broadband and fiber-optic Ethernet connections; manage traffic between segments to optimize network utilization; maintain full throughput; and support any Ethernet/IEEE 802.3 protocol.

With LAN Bridge 100, if a computer is disconnected and reconnected in another segment of the extended local-area network, all bridges will automatically change the routing for information packets with that node address. In addition, the bridge manages network traffic by identifying each computer, printer and device on each segment in the extended network.

There are two versions of LAN Bridge 100. The first for baseband-to-baseband, baseband-to-broadband and broadband-to-broadband is priced at $8,000. The second for baseband- or broadband-to-fiber-optic interconnect is $8,500. Contact Digital Equipment Corp., Maynard, Mass. 01754.

Circle Reader Service Number 208

Gateway Offered

NATICK, Mass. — Proteon, Inc. has introduced the first of its Pronet-Linkway network gateway products. Pronet-Linkway consists of a Motorola Corp. 68000-based microprocessor, two or more network interfaces and gateway protocol software modules. According to Proteon, its Pronet-Linkway products provide information transfer between networks at 1,000 packets/sec, the ability to support multiple protocols and the accommodation of multiple network interfaces. Pronet-Linkway systems start at $9,545. Write Proteon, Inc., 4 Tech Circle, Natick, Mass. 01760.

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PRODUCTS

Wang Introduces Controller

LOWELL, Mass. — Wang Laboratories, Inc. has introduced its Enhanced Asynchronous Device Controller (EADC) that, according to the company, allows Wang word processing, office automation and DP applications to be run on ASCII asynchronous terminals by dialing through a voice/data private branch exchange (PBX). The company added that the EADC provides remote access to Wang VS functions through the use of ASCII-standard portable asynchronous terminals and 2,400 bit/sec modems.

Wang Laboratories also announced its IEEE 802.3 Ethernet-Compatible Service and its IBM PC-Net Service for its Wangnet and Fastlan broadband cabling systems. According to the company, the IEEE 802.3 product enables users to configure five independent Ethernet networks on a single Wangnet or Fastlan cabling plant while the IBM PC-Net allows attachment of IBM Personal Computers, IBM Personal Computer ATs, IBM Personal Computer XTs and compatibles to both Wangnet and Fastlan, providing each network PC is equipped with the IBM PC Network Option.

The EADC is priced at $2,800. The IEEE 802.3 service and the IBM PC-Net

Wang Laboratories, Inc. EADC

Adapter are priced at $3,500 and $400 respectively. Wang Laboratories is at 1 Industrial Ave., Lowell, Mass. 01851.

Circle Reader Service Number 210

Interface Units Debut

TORRANCE, Calif. — TRW, Inc.'s Information Networks Division has announced two new network interface units that allow IBM 3270 terminals to communicate with cluster controllers, IBM mainframes, asynchronous hosts and asynchronous terminals via the company's broadband local-area network.

The Dual Port 3278 Interface supports up to two IBM 3270 Coax "A." Using Coax "A" to asynchronous protocol conversion, data is transmitted across the TRW Concept 2000 broadband local network. Users can select any one of five onboard emulated terminal types, including VT100, VT102, VT52, IBM 3101, TV925 and TTY and can optionally define up to four additional terminal drivers for communication with other nonstandard terminal resources, according to the vendor. The Multiport 3274 Interface provides asynchronous ASCII-to-IBM connections via the TRW local-area network by converting asynchronous data packets to Coax "A" and transmitting the data packets to an IBM 3274/3276 controller.

In a typical installation, according to the vendor, remote IBM 3270 terminals are connected through the Dual Port 3278 over the TRW local-area network to the Multiport 3274 protocol converter, 3274/3276 controller and IBM host. Selection of all operating parameters is via interactive menus without IBM hardware or software modification. In addition, the 3270-type Coax "A" translation has features that enhance typical standalone 3270 terminals, including scrolling, cursor movement, clear screen, line erase and vertical highlighting. On the Multiport 3274, a password system prevents users from changing parameters.

The Dual Port Interface is priced at $1,800. The Multiport 3274 is $17,700 for the 16-port configuration and $32,800 for the 32-port configuration. For further information, contact TRW, Inc., 23800 Hawthorne Blvd., Torrance, Calif. 90505.

Circle Reader Service Number 211

Multifunction System Offered

MORRISTOWN, N.J. — AT&T's recently introduced 6500 Multifunction Communication System allows for simultaneous access from a single 3270-compatible terminal of information stored in several different computers, including mainframes, according to the company.

The 6500 System is comprised of modular controllers, terminals, personal computers and printers that can cluster up to 32 devices that can be connected directly to multiple host computers with synchronous or asynchronous protocols. The 6544 cluster controller has 12 expansion slots and includes support for three 3270-compatible remote host computers; 16 or 32 display, personal computer or printer devices; eight or 16 asynchronous hosts and/or display terminals; X.25/Systems Network Architecture packet network interfaces; and remote access port for diagnostics.

The 6500 System is compatible with AT&T's 4540 and E4540 data terminals and printers and its PC 6300 and PC 6300 Plus.

Pricing for a typical cluster connected to one synchronous host containing eight basic displays, six standard monochrome displays and two printers is $41,020. Write, AT&T Information Systems, Room 2D10, 100 Southgate Parkway, Morristown, N.J. 07960.

Circle Reader Service Number 212

CALENDAR

January 20, Chicago — **Voice/Data Integration: Issues and Answers.** Also, February 10, New York and March 3, Washington, D.C. Contact: Institute for Advanced Technology, 6003 Executive Blvd., Rockville, Md. 20852.

January 20-22, Minneapolis — **Office Automation Systems: Planning and Implementing Strategies.** Also, February 10-12, Washington, D.C. and March 10-12, San Francisco. Contact: Institute for Advanced Technology, 6003 Executive Blvd., Rockville, Md. 20852.

January 21-22, Boston — **Measuring Productivity in Office Automation Techniques for Increasing Productivity and ROI.** Also, January 28-29, New York and January 30-31, Washington, D.C. Contact: Data-Tech Institute, P.O. Box 2429, Lakeview Plaza, Clifton, N.J. 07015.

January 21-23, Los Angeles — **Data Base: A Manager's Guide.** Also, February 4-6, Dallas. Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

January 21-23, Chicago — **Structured Systems Development With Fourth Generation Language.** Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

January 22-24, Washington, D.C. — **Artificial Intelligence: Practical Applications.** Also, February 3-5, Los Angeles. Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

January 27-29, San Diego — **Designing an Office Systems Environment.** Contact: Gartner Group, Inc., P.O. Box 10212, Stamford, Conn. 06904.

January 27-29, Los Angeles — **Decision Support Systems: A New Tool for Management.** Also, February 26-28, New York and March 12-14, Washington, D.C. Contact: Institute for Advanced Technology, 6003 Executive Blvd., Rockville, Md. 20852.

February 3-4, Denver — **Data Base Management Systems and Fourth Generation Languages for Personal Computers.** Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

February 4-6, San Francisco — **Information Systems Architecture: Making Information Engineering Work.** Also, March 31-April 2, Boston. Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

February 4-7, Anaheim, Calif. — **Third Annual Uniforum.** Contact: Uniforum 1986, Suite 205, 2400 E. Devon Ave., Des Plaines, Ill. 60018.

February 4-7, New Orleans — **Managing Today's Workplace.** Contact: Facility Management Institute, 3971 S. Research Park Drive, Ann Arbor, Mich. 48104.

February 5-7, San Francisco — **Integrated Services Digital Network.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

February 9-12, Atlanta — **SAS Users Group International (SUGI) Conference.** Contact: SAS Institute, Inc., Box 8000, SAS Circle, Cary, N.C. 27511.

February 10-13, Los Angeles — **Experts on Networks.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

February 10-14, Los Angeles — **The Productivity Seminar.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

February 24-25, Boston — **Fourth and Fifth Generation Data Management Software.** Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

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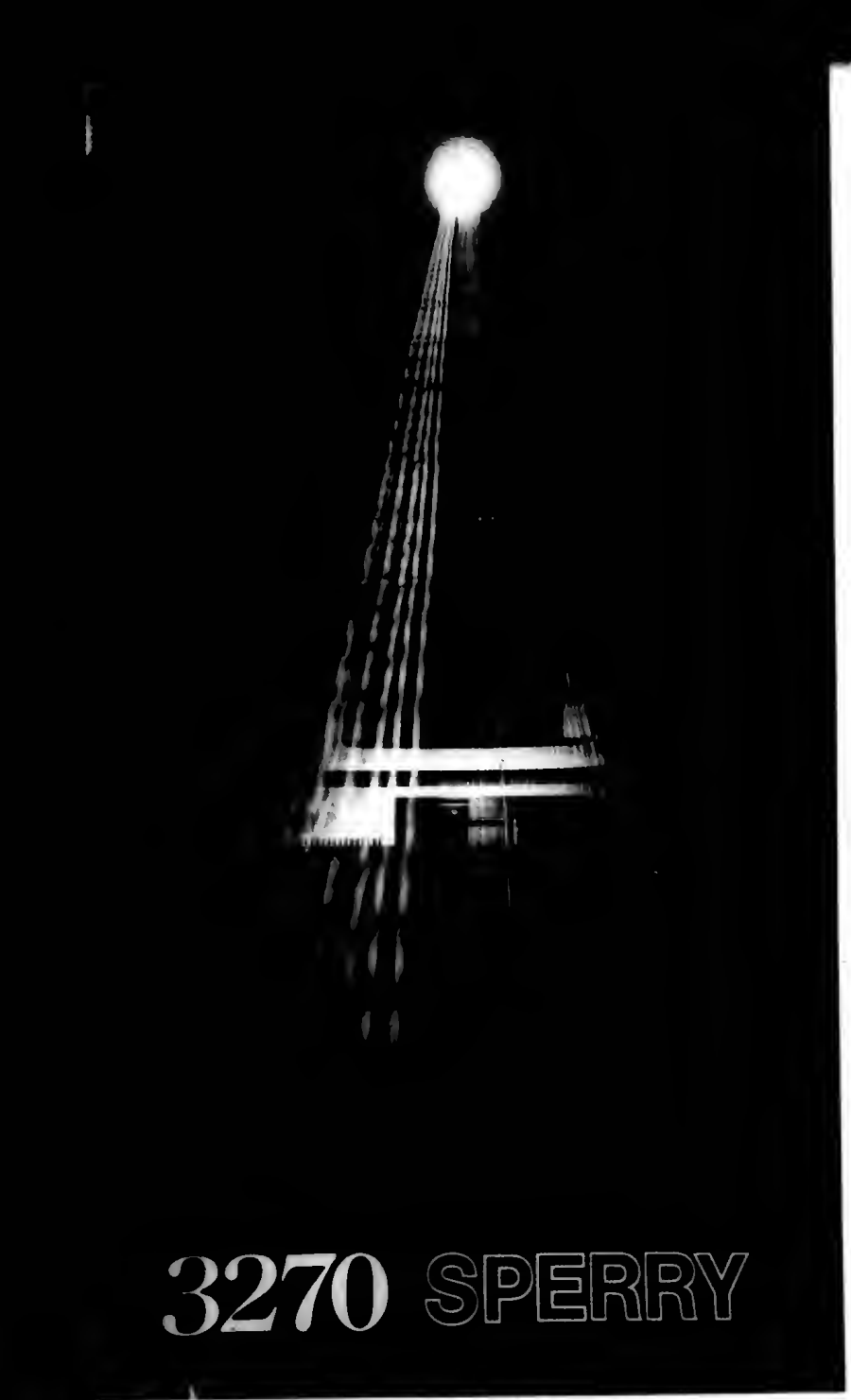

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